STRATEGIC INFORMATION TECHNOLOGY PLAN

STATE CENTER
COMMUNITY COLLEGE DISTRICT

March 18, 2014

CAMPUSWORKS

1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211
T. 941.316.0308 | F. 941.954.2398

www.campusWorksinc.com

CAMPUSWORKS

TABLE OF CONTENTS

CAMPUSWORKS

EXECUTIVE SUMMARY

This document reports on the development of a strategic information technology plan ("strategic IT plan") for State Center Community College District (SCCCD), according to Goal 6.2 of 2012-2016 State Center Community College District Strategic Plan. This strategic IT plan charts the direction for the development and evolution of IT infrastructure, services, and support at SCCCD by providing a snapshot of the current state of information technology at SCCCD, an outline of where the District and its Colleges aspire to be, and recommendations and suggestions for achieving these goals.

The strategic IT plan documents the District's information systems architecture and its supporting IT philosophy, vision, and guiding principles. It does not dictate specific operational solutions, but rather formally articulates the information systems (IS) architecture to provide a strategic context, a "blueprint" from which to make informed operational IT decisions regarding information systems issues, acquisitions, implementations, and ongoing support and maintenance.

The Background section of this strategic IT plan explains the plan's purpose and the planning methodology. Then the strategic IT plan provides a snapshot of the institution's current technology environment, delineating its system components across the five interrelated layers of an IS architecture, which are buttressed by SCCCD's articulated IS philosophy and vision and by guiding IT principles and best practices:

- Network and collaboration systems
- Hardware and operating systems
- Data and knowledge systems
- Software application environment
- Organization, people, and processes

The strategic IT plan then proposes 39 strategic initiatives (Table 1) that are aligned with the institutional mission and vision and can guide detailed derivative tactical/operational plans. Note that within these initiatives, one is key and immediate—Organizational-1: Hire a District Chief Information Officer. Without someone full-time on the Cabinet in this essential position, many of the plan's most important initiatives will be exceptionally more difficult to achieve.

Table 1—Proposed 39 Strategic Initiatives for SCCCD
Network-Related Strategic Initiatives
Network-1: Perform a District-Wide Network Assessment
Network-2: Develop a District-Wide Network Security Plan
Network-3: Implement Ubiquitous Wireless Access
Hardware-Related Strategic Initiatives
Hardware-1: Complete Inventory and Life Cycle Plan
Hardware-2: Develop a Hardware Acquisition Process
Data-Related Strategic Initiatives
Data-1: Complete Conversion to SQL Server
Data-2: Acquire and Implement a Data Warehouse
Data-3: Implement a Document Management System
Data-4: Implement a User-Friendly Ad Hoc Reporting System
Software-Related Strategic Initiatives
Software-1: Implement Identity Management
Software-2: Maximize Ellucian Colleague
Software-3: Complete Software Inventory and Life Cycle
Software-4: Develop a Software Acquisition Process
Software-5: Implement an Electronic Student Education Plan
Organization-Related Strategic Initiatives
Organizational-1: Hire a District Chief Information Officer
Organizational-2: Hire a District Chief Information Security Officer
Organizational-3: Consolidate IT Staffs
Organizational-4: Articulate Information Systems Principles
Organizational-5: Develop a District Operational IT Plan
Organizational-6: Develop a Best Practice Support Model
Organizational-7: Institute a Project Management Function
Organizational-8: Reassess and Revise Business Continuity Plans
Organizational-9: Create Information Security Plans
Organizational-10: Improve Institutional Compliance
Organizational-11: Improve Web Presence
Organizational-12: Improve Online Service Delivery
Organizational-13: Implement a District Portal
Organizational-14: Consolidate the District's IT Help Services
Organizational-15: Analyze and Improve Work Processes
Organizational-16: Institute Technology-Related Professional Development
Organizational-17: Expand Student Access to Networked Computers
Instructional-Technology-Related Strategic Initiatives
Instructional-1: Develop Classroom Design Standards
Instructional-2. Implement a Classroom Management Process
Instructional-3: Explore Learning Analytics
Instructional-4: Acquire Instructional-Designer Expertise
Instructional-5: Feed Grades from Blackboard to Colleague
Instructional-6: Implement Blackboard Mobile Learn
Instructional-7: Provide Persistent File Storage for Students
Instructional-8: Investigate New Instructional Technologies

These initiatives are defined within each section of the IT plan, organized by architectural layer, and are summarized at the end of the plan and aligned to the District's operational goals.

This initial five-year strategic IT plan is not an endpoint for IT planning, but rather a beginning. It should immediately generate a one-year tactical/operational plan to guide IT acquisitions and decisions for fiscal year 2015. The experiences gained during the implementation of that and following one-year tactical/operational plans will further inform and shape the longer-term strategic plan. The strategic IT plan therefore can be adjusted annually and revisited in depth every five years. It is a "living document," responsive to the needs and aspirations of its constituents.

INTRODUCTION

The espoused vision of SCCCD is to demonstrate exemplary educational leadership to foster and cultivate a skilled workforce and an educated citizenry that is well-prepared professionally and personally to contribute to our community.

SCCCD's mission is to be "… committed to student learning and student success, while providing accessible, high quality, innovative educational programs and student support services to our diverse community by offering associate degrees, university transfer courses and career technical programs that meet the academic and workforce needs of the San Joaquin Valley and cultivate an educationally prepared citizenry."

These ideas are also fundamental to *The Student Experience at State Center*, which defines the ideal student experience:

Our students…

Learn in a rigorous and engaging environment that cultivates deductive reasoning skills and creative thinking.
Respect independence and value the support and guidance that is available at State Center.
Take responsibility for their futures.
Value education and seek ways to overcome obstacles.

As faculty, staff and administrators we commit to…

Serve the unique needs of our students so they achieve their personal and professional goals.
Model behaviors we want our students to emulate.
Inspire our students to follow a path to personal and professional development.
Prepare our students for transfer and career opportunities.

To succeed in its institutional vision, SCCCD must aggressively use IT as an ***essential enabler*** to accomplish its mission. To guide its efforts along this path, the District needs to articulate a shared information systems philosophy and vision. The development of a strategic IT plan presents an

opportunity to create that vision of where and how the institution wishes its IT systems to evolve. Some key goals of SCCCD's envisioned IS are:

- Provide the technological infrastructure to support the evolving academic and administrative information requirements for students, faculty, staff, and other stakeholders.
- Provide users with consistent interfaces so that learning to use one system will transfer to other systems.
- Provide authorized users with secure access from anywhere in the world to District and College information.
- Provide flexible and easy-to-use functionality for all authorized persons.
- Integrate information from multiple applications and multiple sources into a coherent view.
- Enable information to be acquired in a timely fashion and made available for access to all with the need and right to use it.
- Enable users to manipulate the available information to fulfill their particular needs without need of a specially trained intermediary.
- Enable well-defined practices for information creation, access, retention, ownership, and associated responsibilities.

Information Systems Principles

The IS philosophy is best articulated through a set of well-defined IS principles. The principles should be determined through a process that engages the District community, seeks consensus, and is regularly reviewed and updated for appropriateness and relevance. Some IS principles relevant to SCCCD are:

- Ubiquitous Access to Information Resources: Access to computing and information resources should be as ubiquitous as access to telephones and the telephone system.
- Data Sources: Data should be acquired in a digital form when it becomes available and stored in a standard database that can be accessed by all who are authorized to use it.
- Data and Document Integrity: A data and document administration function should be implemented to be responsible for proposing and implementing policies and procedures related to all aspects of the data and document management activity.
- Data Ownership and Stewardship: A data and document administration function should be responsible for ownership and stewardship policy and procedures.
- Visibility of Data and Documents: The ability to access, send and receive data and documents without regard to physical location should be possible via networking capabilities and a highly integrated information systems environment.
- Effective Use of Information Technology: Investing in technology without investing in the people who use the technology is not cost effective. The District should educate, train, and support its users to enable them to become technologically literate.

These examples illustrate the kind of principles that can form the basis for informed information systems decisions. They have a longevity and relevance significantly beyond the life of any particular technological solution. The long-range plan for information systems should be based on articulated information systems principles. The effort should begin with a dialogue among the institution's constituents to articulate an information systems philosophy and a set of guiding principles.

Information Systems Best Practices

Experience indicates that community college technology service provision and return on investment is maximized when the following best practices are in evidence:

- Mature technology governance and seasoned executive-level leadership.
- Integrated administrative systems with a continuous process improvement approach.
- Documented policies and procedures reflecting compliance and system utilization.
- Widely adopted course management system and standards for usage.
- Regular, predictable, funded life cycle replacement strategies for all network, hardware, software, and classroom technologies.
- Robust, stable, secured network environment.
- Integrated email and calendaring system for all constituents.
- Comprehensive storage, backup, identity, and information security.

Solid technology plans, with budget support, linked to institutional and instructional strategic plans and priorities.

Once SCCCD's information systems vision is articulated and its goals achieved, IT at SCCCD should have the following characteristics:

- Students have full, easy, and secure electronic access, from anywhere, to information about themselves and their academic and administrative status.
- Faculty and staff have full, easy, and secure access, from anywhere, to the operational information resources they need to fulfill their responsibilities.
- Faculty and academic support staff have information resources to monitor students' progress and proactively-intervene to improve their likelihood for success.
- Administrators and managers have information at their fingertips to support their planning and decision-making. The information systems support user-friendly ad hoc reporting, longitudinal reporting, and data modeling.
- All students, faculty and staff have easy, ubiquitous access to network computing resources, anytime, from all District- and college-based learning and work spaces.
- All information systems present an intuitive, easy-to-learn, and easy-to-use interface to information.

- Technology is seamlessly integrated into the classroom, coursework, and curriculum.
- All SCCCD learning, information, and support services are available online.
- All members of the SCCCD community operate at a high level of computer literacy, seamlessly employing information technology in their day-to-day work.
- The District's web presence is quickly and easily adaptable to its changing informational, technological, and cultural needs.
- Information users and IT staff work in close partnership in an open on-going collaborative process to facilitate IT-related decision making.
- Work processes are documented and fully-supported online.
- Support services include self-instructional programs for just-in-time and continuous learning activities.
- Support services include rich online collaborative interactions for all interested staff and faculty.

The District's communications infrastructure and network-based applications will create a virtual institution that appears as a single integrated unit to users. Faculty, students, staff, and administrators will be able to quickly and easily access—whether on-campus or remotely—the information and tools they need to accomplish their goals. Employees will be involved in the decisions about what systems are implemented and how systems are integrated and will behave. Systems will be evaluated on a continuous basis and will be replaced, enhanced, or eliminated based upon the results of the evaluations. Wherever feasible, the District's systems will be built using industry standards, which will allow information and functionality to move from one set of hardware and software to another with relative ease.

BACKGROUND

SCCCD serves parts of four California counties (Fresno, Madera, Kings, and Tulare), covering 5,500 square miles and populated by about one million people. The District supports two colleges (Fresno City College and Reedley College) and three centers (Willow International, Madera, and Oakhurst). As one of the larger community college districts in California, SCCCD serves approximately 30,600 students at its two colleges and four centers. The overwhelming majority of the District's enrollments are from its four-county service area.

The IT infrastructure at SCCCD covers eight network sites and is supported by professional IT staff at the District Office, Fresno City College, and Reedley College:

- District Office: The District Office IS Department is led by the Director of Information Systems and staffed by 12 analysts, programmers, technicians, coordinators, and specialists. The department provides district-wide support for the Ellucian Colleague ERP (hereafter "Colleague"), telephones, network services, remote-access services, video conferencing, web design, faculty and staff email, and help desk services. It also provides desktop and file-

services support for District Office staff.

- District Office North: The District Office IS Department provides support remotely to the District Office North for computers, software, and audio-visual services.
- Fresno City College: The Fresno City College Technology Support Services Department is led by the Director of Technology Fresno City College and staffed by 17 technicians, specialists, coordinators, and support staff. The department supports campus computers, the campus network, classrooms, audio-visual services, shared file resources, the help desk, and the Blackboard course management system (CMS) for the campus.
- Career and Technology Center: The Fresno City College Technology Support Services Department provides support remotely to the Career and Technology Center for campus computers, classrooms, and audio-visual services.
- Reedley College: The Reedley College Computer Services Department is led by the Director of Technology Reedley College and staffed by five technicians and specialists. The department supports campus computers, the campus network, classrooms, audio-visual services, shared file resources, and the Blackboard CMS for the campus. The department Director reports jointly to presidents of Reedley College and the Willow International Center.
- Willow International Center: The Willow International Center Computer Services Department is led by the Director of Technology Reedley College and staffed by one full-time technician and two part-time technicians. The department supports campus computers, classrooms, and audio-visual services.
- Madera Center: The Madera Center Computer Services Department is led by the Director of Technology Reedley College and staffed by one technician. The department supports campus computers, classrooms, and audio-visual services.
- Oakhurst Center: The Reedley College Computer Services Department provides support remotely to Oakhurst Center for campus computers, classrooms, and audio-visual services.
- In December 2013, SCCCD retained CampusWorks to provide IT strategic planning services to facilitate the development of a strategic IT plan. This document reports on the initiative to create this long-term IT plan, informed by the strategic vision of the District, with input and in collaboration from faculty, staff, administrators, students, and consultants. About 270 individual faculty, staff, students, and administrators representing 29 groups across the institution participated in the development of this strategic IT plan (see *Appendix A: Acknowledgements*).

Purpose

This strategic IT plan addresses one of the Organizational Effectiveness goals stated in the District's 2012-2016 State Center Community College District Strategic Plan (Goal 6.2: Review and update the District Technology Plan). Its purpose is to chart the direction for the development and evolution of IT infrastructure, services, and support at SCCCD. It provides a snapshot of the current status of information technology at SCCCD; explains the District's IS architecture and its supporting IT

philosophy, vision, and guiding principles; outlines where the District aspires to be; and identifies 39 strategic IT initiatives that SCCCD should undertake to get there.

Planning Methodology

The CampusWorks strategic IT planning approach analyzes an institution's information technology infrastructure in relation to the components typically found in an enterprise IS architecture. These components define a framework for decision making and a structure for ongoing strategic and tactical planning. This formally-articulated information systems architecture will serve as a valuable set of guidelines (a "blueprint") for making informed decisions about information systems issues, acquisitions, implementations, and ongoing management.

Though not dictating specific operational solutions, the strategic IT plan provides a strategic context within which to make operational IT decisions. The plan should be reviewed annually to drive the one-year tactical/operational IT plans to fulfill it, and should be revised every three-to-five years for accuracy and relevance and to ensure that it continues to align with the District's mission, vision, espoused values, and strategic direction.

STRATEGIC INFORMATION TECHNOLOGY PLAN

The strategic IT plan begins with a snapshot of the institution's technology environment at the start of the planning period, structured according to standard IS architecture. The plan delineates the institution's system components across the five interrelated layers of that architecture and in the context of SCCCD's articulated information systems philosophy and vision, and of guiding IT principles and best practices. From within this framework, the plan's group of proposed strategic and tactical/operational initiatives will guide detailed derivative tactical/operations plans that are aligned with the institutional mission and vision.

Because the institution's core mission is instruction, the section also reiterates and expands the instructional infrastructure components of the strategic IT plan.

Information Systems Architecture

The CampusWorks approach analyzes an institution's information technology infrastructure in relation to the components typically found in an enterprise IS architecture.

Figure 1—Components of an IS architecture.

The IS architecture is layered and interrelated. It delineates the network, hardware, software, data, and people components of the institution's information systems, within the context of the institution's information systems philosophy and guiding IT principles and is informed by industry standards and best practices.

The remainder of this section of the strategic IT plan defines the layered IS architecture from the bottom up, delineating the information systems in use and appropriate within each technology niche, explaining best practices, and proposing strategic initiatives to help realize the envisioned information systems architecture.

Network Infrastructure

The Network Infrastructure component of IS architecture involves the network and communications hardware and software.

Network Backbone

SCCCD supports eight network sites, as discussed in the Background section above.

All campus networks connect through the District Office data center adjacent to the Fresno City College, with 1 GB connectivity to Reedley College, 100 MB to Madera Center, 100 MB to Willow International Center, 20 MB to Oakhurst Center, and 10 GB to Fresno City College.

Within the campuses, buildings typically are connected via fiber optic cable with from 1 to 10 GB connectivity. Network wiring is being migrated from Cat-5 to Cat-6 cabling.

Network Wiring Closets and Switches

Most of the buildings across the campuses are being migrated from Cisco switches to Juniper switches. Reedley's switch migration is complete and now offers 1 GB connection to the desktop. Wiring closets, especially in the newer facilities, typically are secured, equipped with uninterruptible power supply (UPS), and dedicated to their singular purpose.

Figure 2—Secured wiring closet on Willow campus is organized and well-kept.

Publicly-located wired ports are generally unprotected, allowing anyone with a network cable to plug into any activated network port and gain unauthenticated access to the District's network. This could be done, for example, in a classroom by disconnecting the network cable from the instructor's computer and inserting it into a laptop. At Reedley College, network administrators observed high-bandwidth multiuser games ("League of Legends") being played on open-wired ports and they disabled the ports. Staff at Fresno City College are beginning to implement 802.1X standards to allow port use to be restricted to those who can authenticate against Active Directory.

Students and faculty generally reported good network responsiveness and performance when using wired ports.

Wireless Network

Demand for wireless access is relentlessly increasing across all college campuses as institutions struggle to accommodate student laptops and the proliferation of mobile devices. Consequently, it is not surprising that both students and faculty have complained about wireless coverage and performance across all of the District's campuses. The District does not currently provide ubiquitous wireless access in all of its learning and work spaces.

As a result of a collaborative effort between SCCCD's three IT directors, the District and Colleges are migrating from Bluesocket wireless equipment to Aerohive equipment, using the most current 802.11n standard. The wireless migrations at Fresno City College and the District Office are nearly complete, with 192 wireless access points on the Fresno City campus, including outdoor areas. Reedley College began migration in early 2014.

Because of its self-configuring architecture, the Aerohive solution allows additional wireless access points to be added on demand to support special or high-profile events or when network administrators observe a significant number of users accessing a single wireless access point.

Communication and Collaboration Systems

In 2013 the District began migrating in earnest to a Voice over Internet Protocol (VoIP) phone system using Cisco Call Manager. This migration is now complete, although some traditional copper phone lines have been retained for backup and emergency purposes. VoIP phones also are being installed in the classrooms to replace the emergency panic buttons. These VoIP phones use SingleWire software to allow mass notification functionality.

The District supports 30 video conferencing facilities across seven of its sites. Local campus IT personnel maintain the video conferencing equipment. Video conferencing sessions are configured and managed remotely by the Distance Education Support Technician at the District Office. The video conferencing infrastructure is used primarily for administrative (noninstructional) purposes.

The video conferencing facilities include conference-room and classroom configurations. About one-third are listed as "distance education classrooms." These facilities use Polycom codecs and peripherals and communicate using the Internet Protocol (IP). About one-fourth of the rooms have high-definition (HD) capability.

Most of the District equipment is capable of multipoint conferencing, allowing up to four sites to participate in a single conference by sharing bandwidth through the existing codecs. The District does not currently have a conference bridge (Multipoint Conferencing Unit, or MCU), but the District expects to acquire one soon. Having an MCU would allow each site to connect at its full bandwidth capability and would enable additional simultaneous connections. The District also may obtain bridging capability from CENIC, a California consortium.

District videoconference users often report that the video portion of conferences drops or exhibits temporary "greeking," rendering participants unrecognizable, and that the audio portion sometimes becomes garbled. These problems typically are the result of network bandwidth limitations during peak usage times. They can be addressed by improving bandwidth, implementing quality of service (QOS) adjustments to the network, using an MCU instead of the codec-based multipoint capability, and taking data communications out-of-band by using a web-conferencing tool such as that provided by CCC Confer.

The CCC Confer project is funded by a grant from the California Community Colleges Chancellor's Office and is intended to offer the California Community College system a viable means to meet and collaborate at a distance. SCCCD can use this service to provide its faculty, staff, and students with powerful web-conferencing capabilities using Blackboard Collaborate (formerly Elluminate) software.

Network Monitoring

Network access and bandwidth usage at Fresno City College is monitored with Orion software, which sends alerts when anomalies are detected or thresholds are crossed.

Network and Telephone Acquisition Policies

The individual Colleges initiate network-related purchases for their individual areas through the Central Purchase Office. For wireless access points, the IT Directors recently selected Aerohive as the preferred vendor. For telephone and video-conferencing equipment, the District Office IT group specifies the equipment standards and the central purchasing office forwards all such requisitions to the District IT Director for approval before purchase.

Network-Related Strategic Initiatives

This section proposes a set of network-related strategic IT initiatives to guide decision making during the five-year planning period. These initiatives, and others that may be proposed, will need to be prioritized by importance, impact, and prerequisite relationship with all other proposed initiatives.

Strategic Initiative	**Network-1: Perform a District-Wide Network Assessment** *Perform a detailed District-wide network performance assessment and recommend improvements.*

SCCCD's network is large and complex, supporting administrative, faculty, staff, and student users on wired and wireless networks across eight physical locations, administered by three different IT groups. Users of the various network services and applications have reported varied experiences. The District should perform a thorough network-performance assessment to identify physical bottlenecks in the network at the wide-area and local-area levels.

This activity is also critical for eliminating physical network issues as a factor in connectivity problems experienced with Colleague, streaming video, and video conferencing.

Strategic Initiative	**Network-2: Develop a District-Wide Network Security Plan** *Develop and implement a District-wide network security plan encompassing all Colleges and Centers.*

The District should develop a formal network security plan to identify and address security vulnerabilities so that resources are appropriately applied to ensure a secure network environment.

Strategic Initiative	**Network-3: Implement Ubiquitous Wireless Access** *Extend wireless network coverage to all classroom and nonclassroom learning spaces.*

Faculty and student users reported that wireless coverage is weak and spotty in some areas and that much of the existing wireless authentication scheme is neither user friendly nor mobile- device friendly,

necessitating repeated authentication actions during the day. They report that wireless access is inconsistent throughout the District and within each campus. The Fresno City College wireless network has seen significant improvements over the previous BlueSocket implementation by converting to Aerohive technology.

The wireless network should be available and reliable within all classroom and nonclassroom learning spaces, and in all work spaces throughout the District. The strategic IT planning participants identified this as a high priority to complete throughout the District.

Hardware Platform Infrastructure

The hardware platform infrastructure component of the information systems architecture addresses the physical hardware platforms in use for application support, database support, file repositories, web support, desktop support, and mobile computing support.

Server Environment

Fresno City College IT staff maintain 32 physical servers and 54 virtual servers, including those used to support the Bookstore and the Career and Technology Center. They use VMWare and Dell rack servers for their virtualized environment. The District Office also deploys VMWare with Dell servers to host 63 virtual machines.

Reedley College and the Madera, Willow, and Oakhurst Centers support 24 physical servers and 53 virtual servers, as well as 10 Virtual Desktop Interface (VDI) servers that will eventually support 445 thin client devices. The Reedley College IT staff use Microsoft Hyper-V for their virtualized operating system on Dell servers.

File Storage Systems

Several systems at the District and Colleges support user file storage. For example, at Fresno City College, faculty and staff have private network drives that are mapped to a Microsoft Windows Server upon login to their college-provided computer. This network drive (the "P:" drive) is accessible from anywhere on campus and is automatically backed up. Faculty and staff also have access to shared division and open drives. A few faculty and staff have been given the ability to access their mapped drives remotely (from home or another networked location) using remote access services. Students generally are not granted networked persistent file storage, but do have access to the cloud-based file service, OneDrive (formerly SkyDrive), as part of their institutional Microsoft Office 360 account.

Fresno City College uses a combination of backup solutions. Veeam Backup and Replication is used for a weekly Sunday full backup of all virtual servers and for Monday through Thursday incremental backups. Symantec Backup is used for a weekly Friday full backup of all physical servers and for differential backups on Wednesdays. Windows Backup 2003 and 2008 are used for full data-only backups on Sundays for both physical and virtual servers and for differential backups on Wednesdays.

Veeam and Symantec backups are backed up to a Nimble iSCSI system. The Fresno City College Nimble system hosts a total of 255 TB storage encompassing primary storage, backup storage, and disaster recovery storage. Additionally, Fresno City College is using Microsoft Volume Shadow Copy Service (VSS) to back up and recover data stored in the open, private, and division drives.

The District Office currently uses an EMC Storage Area Network (SAN) and is moving to a Nimble iSCSI solution. The District uses Veeam and Hewlett Packard's Data Protector for backups.

Personal Computer Environment

SCCCD mainly has deployed Windows computers under the Windows 7 operating system, with some limited Windows XP devices remaining. Macintosh OS-X computers are also available in some computer labs and with individual faculty and staff.

Fresno City College and the Career and Technology Center provide approximately 3,100 computers for faculty, staff, administrators, and instructional labs. About 900 of these are faculty and staff machines and the rest are installed in computer labs.

Reedley College and the Willow, Madera, and Oakhurst Centers support approximately 2,400 computers for faculty, staff, and students, with 1,767 of these available to students in the instructional and open computer labs.

The District Office supports 130 computers for its staff and administrators.

Fresno City College has standardized on Citrix Xen on top of VMWare hypervisors for virtual desktop infrastructure, and has deployed 100 VDI machines for Title V cohort participants. Reedley College and the Willow and Madera Centers are deploying 445 virtual desktops as a replacement strategy for desktop computers in the open computer labs and in some instructional computer labs.

Mobile Computing Environment

SCCCD has improved the security of its wireless networks over the past two years. At all but the Oakhurst Center, wireless users are required to authenticate against Microsoft's Active Directory server using their network username and password (for students, this is their student ID). The Oakhurst Center wireless network will be converted to authenticate against Active Directory in the summer of 2014. Some wireless access points require a WEP key for access or entry of the user device's unique network key into the network database, in addition to Active Directory authentication. Unfortunately, the increased security has come at the expense of user friendliness, which has been particularly problematic for users of mobile devices.

Mobile devices (e.g., iPads) drop their network connection when the mobile display darkens (as do laptops when the lid closes), requiring reauthentication. Several students and faculty at the Reedley College noted that it sometimes takes 10 minutes to reestablish a network connection.

Students have begun to demand full mobile access through native smartphone applications to all of their information resources, such as they have with their banks, shopping, entertainment, etc. They are particularly interested in access to WebAdvisor and Blackboard, but also to campus information

about events, office locations, etc.

The District does make the free version of the Blackboard Mobile Learn app available, but because it cannot be used via cellular data plans (it is limited to direct Wi-Fi connections), its adoption by students has been limited to date. In fact, many of the students interviewed did not know it was available. After a trial installation, the District elected not to implement mobile access using Datatel MOX, but is currently considering the Ellucian mobile application. The counseling staff at Willow are developing their own mobile app for campus information.

Printing and Scanning Systems

The printing environment is different at each campus and different tools are used to manage student printing. Fresno City College supports approximately 150 printers, with Hewlett- Packard as the established standard. Reedley College and the Centers provide approximately 344 printers for faculty, staff, and student use, with Dell being standard.

Approximately 40 multifunction devices are deployed in high-use offices. In 2012, the District negotiated a five-year contract for the use of its multifunction devices.

Hardware Acquisition Policies

Fresno City College uses single vendors for the purchase of Dell and Apple computers. Nearly all technology-related purchases use the Technology Request Form (TRF) process. This process is used to help Fresno City College understand the total cost of ownership of a technology purchase, including support.

At Reedley College and the Centers, the replacement process for equipment is managed by the Computer Services Department. The five-year replacement goal is reviewed through a college-wide process that allows feedback and input for the annual replacement order. New equipment is reviewed by the college-wide action planning process which allocates funds available to the college.

The IT directors make every effort to plan for equipment life cycles in the areas of computers, projectors, network switches, etc. Unfortunately, funding considerations have limited the amount of money available in stable recurring budget line items, requiring each planned purchase to necessitate a separate competitive funding request. This type of funding scenario turns planning activities into wish lists.

The District does not have complete district-wide hardware inventory. Also, the individual IT directors and the purchasing department keep separate records of all technology purchases. The IT directors meet bimonthly and informally discuss future purchases, which the purchasing department works to pool to allow for economies of scale, but there is no single formal process or procedure to acquire hardware throughout the district.

Hardware-Related Strategic Initiatives

This section proposes a set of hardware-related strategic IT initiatives to guide decision making during the five-year planning period. These initiatives, and others that may be proposed, will need

to be prioritized by importance, impact, and prerequisite relationship with all other proposed initiatives.

Strategic Initiative	**Hardware-1: Complete Inventory and Life Cycle Plan** *Complete a system inventory and associated life cycle replacement plan and budget.*

Hardware life cycle planning recognizes the importance of computer-related hardware to work processes, the excessive costs of supporting obsolete equipment, and the need to carefully plan for timely upgrades and replacements. Life cycle planning involves not assessing existing hardware and developing a schedule to replace computers every three to five years, but also budgeting for, implementing, and monitoring fulfillment of those plans.

Strategic Initiative	**Hardware-2: Develop a Hardware Acquisition Process** *Develop a formal process for assessing and acquiring hardware throughout the District to reduce inconsistent hardware decisions and facilitate opportunities to leverage purchases.*

The District must take a systems life cycle approach to managing the technology portfolio of the institution, ensuring technology decisions that are right for the District and Colleges, good buy-versus-build decisions, effective management of the technology portfolio (including right-sourcing decisions), and institutional review at each critical stage of the product life cycle.

Data and Document Infrastructure

The data and document infrastructure component of the information systems architecture addresses the policies, repositories, and tools to store and manage the institution's data and document resources.

Database Management Systems

Database management systems (DBMS) are software applications that enable the creation, maintenance, and use of databases. Databases store all of the electronic data and information resources that the District uses in its work.

In addition to UniData (the database used by Colleague), SCCCD supports Microsoft SQL Server and Access databases. In practice, many end users use Microsoft Excel and Word tables to manage their data.

Data Warehouse

Building a data warehouse requires a deep understanding of all of the data, as well as a thoughtful design of the warehouse and its intended uses, especially for longitudinal reporting. Management-

report administrators must be involved in the data mapping, data dictionary definitions, table building, and rule definitions that underpin the query and reporting capabilities. It also is important to identify census dates and to be sure that census data is captured and made available to users who analyze "point in time" trend data.

The District has not implemented a data warehouse, but the District's database administrator (DBA) has begun designing one. The District has also taken an important first step in providing selected users with access to a regularly-updated extract of Colleague data into a Microsoft SQL Server database. These users have been gaining experience in querying this nonproduction reporting database using SQL commands as well as in running prepared queries, fulfilling reporting requirements formerly met directly via Colleague's production UniData database.

Content/Document Management

Document management systems store and manage the institution's electronic files and documents, allowing them to be organized, searched, shared, and securely accessed by authorized users. Enterprise content/document management systems typically support facilities for document storage, tagging and searching with metadata (descriptive data about the documents), secure access, versioning, publishing, and so on.

At SCCCD, faculty and staff have access to network drive mappings at the individual (P: drive) and shared levels. These are only available when on-campus or via a limited remote access protocol. In practice, faculty and staff groups share documents using the "organization" feature of the Blackboard Community System. District Office personnel have not used this feature to any great extent. Faculty and staff also report using external systems, such as Google Drive, to share documents with their colleagues and students.

Students do not currently have access to an institutionally-supported file store, but some are using Microsoft's OneDrive (SkyDrive) in association with their Office 365 accounts.

Data Administration

One of the benchmarks of a well-designed database is the ability to maintain the data and data relationships needed to produce reports with total data integrity at any point in time. An important component of data administration is the existence of a centralized data element dictionary (DED) that defines the purpose, format, usage, ownership, stewardship, and relationships of every data element. It is critical that such a data element dictionary be made visible to those who need to access and use the data.

The District IT group has one DBA, and this role supports the SQL Server reporting extract from Colleague, prepares commonly used reports against this database, and supports its users. There is no DED beyond that provided in the Colleague UniData database.

Institutional Reporting Systems

Users often run "canned" reports from Colleague and its SQL Server reporting extract. Advanced Colleague users formerly used the UniData "colon prompt" to create and launch ad hoc reports

against Colleague data, but now have been migrated to the SQL Server extract. Many staff members expressed the need for a simpler tool to allow them to make ad hoc queries without having to learn SQL commands and syntax. End users at SCCCD also routinely use Microsoft Access and Excel for reporting, sometimes from locally-maintained shadow systems.

Data Stewardship

An important aspect of the data component of the IS architecture is the need to clearly define who owns data, who has stewardship of data, and who is authorized to have access to data, as well as the specific responsibilities of ownership, stewardship, and access. Policies regarding these issues must be carefully reviewed and amended as necessary.

Data and document owners typically delegate this stewardship to units or individuals within the organization. Data stewards then have the responsibility to ensure the implementation of procedures to manage the data in accordance with the information policies of the organization. This does not transfer ultimate responsibility for the data from the owner. The joint responsibility of the owners and stewards of data and documents must guarantee its creation, accuracy, integrity, reliability, security, accessibility, etc.

Data Policies

The data and document administration function is responsible for proposing and implementing policies and procedures related to all aspects of the data and document management activity. Primary among these responsibilities are identifying and defining data and document sources, creating an institution-wide data and document model, maintaining enterprise-wide data and document standards, analyzing documents and defining Document Type Definitions (DTD), standardizing data and document naming conventions, defining a data model in conjunction with users, resolving data and document ownership issues, tracking the content of the institution's databases and information repository, designing and implementing training and informational programs, and evaluating and recommending data and document management software.

The data and document administration function should be separate from the database administration function for security administration purposes. Database administration is responsible for designing and developing databases in conjunction with programmers and analysts, monitoring and improving database performance, enforcing standards and protocols, managing information repositories, implementing database security, implementing database backup and recovery procedures and supporting the operational aspects of database management systems.

Shadow Systems

Shadow systems are databases and their related applications that are built to use and expand on copies of data extracted from centrally-managed enterprise systems. For example, a student service office might download student bio/demo data from the student information system into a local Access database and add additional data fields that are relevant only to their idiosyncratic function. As a result, student data exists in two places: the original in the student information system and the copy in the local shadow system.

Shadow systems at SCCCD exist in at least two of the District's Disabled Students Program and Services (DSP&S) organizations. Both units found it necessary to build local Microsoft Access databases that replicate data in Colleague, and routinely reconcile their local data with Colleague to create accurate service reports required for funding.

The presence of shadow systems often indicates gaps in existing system data stores. A problem with shadow systems is that the data they contain may be more recent, more accurate, or more pertinent to the institutional mission than the original data. When the District's records are audited, the auditors look to the systems of record (the systems supported by central IT) rather than the shadow systems. Therefore, users who develop shadow systems can unwittingly cause audit exceptions for the institution. Another issue is that shadow systems are not subject to the data and system security provided in the enterprise environment.

Data-Related Strategic Initiatives

This section proposes a set of data-related strategic IT initiatives to guide decision making during the five-year planning period. These initiatives, and others that may be proposed, will need to be prioritized by importance, impact, and prerequisite relationship with all other proposed initiatives.

Strategic Initiative	**Data-1: Complete Conversion to SQL Server** *Complete the existing project to convert from UniData to MS SQL Server as the operational database for Ellucian applications.*

The Colleague ERP system implemented at SCCCD uses the proprietary UniData database (a nonrelational file system) to store its records, but most of Ellucian's development work is directed toward its newer relational platform, SQL Server. SCCCD needs to complete its planned migration from UniData to SQL Server.

Strategic Initiative	**Data-2: Acquire and Implement a Data Warehouse** *Investigate and implement a data warehouse to support longitudinal and ad hoc reporting.*

To date, the District has not formally initiated plans to build a longitudinal database, but the District DBA has begun experimenting with one in response to the perceived need. Many desired reporting initiatives require a database that can capture student data in cohorts.

Strategic Initiative	**Data-3: Acquire and Implement a Document Management Solution** *Investigate, analyze, and develop a document management solution to serve students, faculty, and staff.*

Document management systems store and manage the institution's electronic files and documents, allowing them to be organized, searched, shared, and securely accessed by authorized users. Enterprise content/document management systems typically support facilities for document storage, tagging and searching with metadata (descriptive data about the documents), secure access, versioning, publishing, and so on.

Though SCCCD does support systems for user file storage and management, including mapped network drives and some use of Blackboard organizations for faculty committees and working groups, the District has not yet committed to enterprise content or document management systems.

Strategic Initiative	**Data-4: Implement a User-Friendly Ad Hoc Reporting System** *Investigate, analyze, acquire, and deploy a user-friendly ad hoc reporting tool for the SQL Server environment.*

SCCCD provides a wealth of data resources from the Colleague systems (student, financial, and human resources) in a regularly-updated SQL Server database, and has aspirations to create even more data in a longitudinal data warehouse. Would-be users of data have two challenges before they can take advantage of these data stores. One is understanding what each data field means and how it relates to other fields in online screens and printed reports, which can be addressed by the creation and publication of a data element dictionary. The second is understanding how to join database tables and write queries in the SQL language.

This challenge can be addressed by training and by the acquisition of a graphical, user-friendly reporting tool such as IBM's Cognos business intelligence tool or Microsoft's Access database.

System and Application Software

This component of the information systems architecture addresses the array of system, communication, and application software that the institution uses to address its goals.

Computer applications are acquired and developed to satisfy the service and business requirements of the institution. Applications acquire, process, store, and report data about events both inside and outside of the institution. Computer applications not only automate operations, but they have the potential to informate, that is, to produce information that can help the District assess whether it is achieving its missions and help it to formulate strategies for achieving those missions.

System Software

System software is a specialized software application that acts as intermediary between the physical hardware and the software applications (such as a word processing program or the

Colleague system) that run on the hardware. In general, software versions across the District are slightly behind the most-recent updates.

Identity Management System

An identity management system manages the identity information of individuals and groups that are authorized to access institutional systems. Identity management systems are used to authenticate user access to systems, authorize their access to data resources, identify and manage their institutional roles, and determine their access privileges.

Currently, at least four different accounts (username/password combinations) are necessary for a student to use the District and College information systems:

Table 3—SCCCD User Name and Password Combinations

System	Username	Initial Password
Email	Lastname_StudentID	"Passw0rd"
WebAdvisor	Lastname_StudentID	Birthday
Blackboard	StudentID	StudentID
Network	StudentID	StudentID
Network (Reedley)	Initials###	Varies by site
Library database (off-campus)	StudentID	StudentID
Library database (on-campus)	StudentID	No password required

This current system has several problems and vulnerabilities, in addition to the obvious difficulties and frustrations of maintaining four separate accounts. These include:

- Recipients of a student's email immediately know the sending student's ID number.
- Student ID numbers that are compromised can be used to access the network. (This password cannot be changed by the user.)
- Student ID numbers that are compromised can be used to access Blackboard unless the student has already changed the initial password. About one-third of the students participating in student forums indicated that they never changed this initial password. (Blackboard does not force a password change on first login.) This could compromise confidential grade information and open possibilities for account misuse.
- If a student's birthday is known, the Colleague WebAdvisor account could be compromised, potentially allowing improper access to personal information and/or changes to course registrations. (WebAdvisor does force a password change on first login.)

Faculty, staff, and administrator accounts are similarly structured and vulnerable, although they are much more likely to change initial passwords than students are, and some systems force them to do so when they initially log in.

Throughout the information gathering for this strategic IT plan, the need for a single sign-on system was the most-requested IS change, with nearly unanimous support from students, faculty, staff, and

administrators.

Enterprise Resource Planning Systems

An institution's enterprise resource planning (ERP) systems hold repositories of work transactions, provide the basis for data-driven decision-making, and are central to all constituent service delivery. The ERP system manages the data that tells the institution what it knows about itself, and reflects the policies, practices, and management of the institution.

Even in the best of circumstances, an ERP implementation is a challenge requiring a high degree of collaboration between administrative and academic staff and leadership with the appropriate technology resources. The technology staff members provide the technical foundation—the servers, databases, software applications, backups, and network. The functional office staff members provide the direction, functional rule setting, and assessment of the success of the implementation.

Table 4—Types of ERP Systems			
Course Management	Curriculum Management	Student Information	Financial Information
Human Resources Information	Facilities Information	Library Information	Customer Relationship Information

The District's Primary ERP Components

SCCCD implemented the Colleague higher education integrated system in January 1997. The District purchased:

- Colleague Student
- Colleague Finance
- Colleague Human Resource and Payroll systems

Colleague applications are fully integrated, with Colleague Core at the center of this integration, providing a central location for information and processing rules used throughout the system. Data is entered only once, and is then shared with all modules and authorized users.

As an early-adopter, SCCCD needed to customize some of the original Colleague modules, which complicated the upgrade processes and caused them to miss some of the enhancements to core Colleague functionality over the past 17 years. Most administrators and staff concur that at this stage in the evolution of SCCCD's information systems, it is time to reexamine the District's business processes to determine how they can be enhanced by updating Colleague functionality.

At SCCCD, Colleague currently uses Ellucian's proprietary UniData database, but the District is actively testing the conversion to Microsoft's SQL Server, the new preferred platform for Ellucian.

Course Management System

SCCCD uses the Blackboard course management system. Originally acquired in about 2000 and

hosted locally, the system now is hosted by Blackboard and consists of the Blackboard Learn and Blackboard Community systems. SCCCD also supports the following building-block extensions to Blackboard:

- Who's Online
- Turnitin
- Online Attendance
- Publisher interfaces
- Merlot search
- Respondus Lockdown Browser
- Turning Technology

Although Blackboard course sections are automatically created for every course in Colleague, faculty adoption is limited, with about half making the course sections available to students. According to student reports, usage often is limited to posting syllabi and documents. Students reported little or no use of collaborative components such as wikis, blogs, discussion boards, chats, and group capabilities.

Curriculum Management System

Whereas course management systems manage courses, curriculum management systems help define them. Several of SCCCD's campuses use the CurricUNET curriculum management tool. CurricUNET has the ability to manage the curriculum process from initial course proposal and documentation through the approval and modification processes, and on through catalog publication and Web page creation.

Library Information System

The libraries at each campus function independently, but meet regularly to facilitate coordination and share solutions. The libraries currently use the Millennium system (by Innovative Interfaces, Inc.) to track books and materials throughout the District. All of the libraries intend to migrate from Millennium to the OCLC WorldShare Management Services. Users can access licensed electronic resources remotely via EZProxy.

The libraries all provide print services to their student constituents, using different systems, both manual and automated. For example, Willow International Center uses the iMedia print card system to purchase printing credits to use in the Open Lab. Reedley College has adopted a card system because they have resident students who use the card to get access to other services.

Communication and Collaboration Systems

The primary communications and collaboration systems in use within the District include the nearly-complete VoIP telephone system, the network of 30 videoconferencing facilities across the seven of the eight District sites, the CCC Confer web-conferencing system, and the Blackboard Learn and Community Systems (blogs, wikis, and discussion boards).

Every faculty and staff member is provided with an institutional email account through Microsoft Exchange, with an address at scccd.edu, fresnocitycollege.edu, or reedleycollege.edu. The faculty and staff exchange server is administered by the District Office. All students are provisioned with "my.scccd.edu" accounts through Microsoft Office 365 (formerly Live@edu). Student accounts across the District are administered by Director of Technology for Fresno City College.

Some faculty reported using Skype and Google Hangouts to collaborate with students and colleagues.

Web Presence

The District's website provides information to external audiences and helps to market the Colleges. The District website and the Colleges' websites consistently were listed among the greatest concerns of faculty, staff, administrators, and students. Concerns included:

- Finding information is difficult, often requiring excessive scanning of crowded pages and an excessive number of clicks to reach desired content.
- Information often is outdated.
- Pages are inconsistent across campuses. For example, student support staff who are knowledgeable about how to locate key information (such as the student orientation) at their home campus are lost when trying to help a student locate the same resource at a different campus website.
- The search function often yields inappropriate and useless links.
- Some users find it difficult to update information. Though many have direct access to the underlying content management system, enabling them to make content changes directly, others must invoke a paper-based process to make changes.
- Navigation is difficult, e.g., one cannot always return to the previous page.
- Some links do not function from off-campus, returning an error message.
- The system occasionally launches undesirable error messages that do not present a positive message to the District constituents. For example, clicking certain links to the Willow International Center (among others) prompts a message that "You are now exiting the State Center Community College District." The Web Master has indicated that these can be corrected if the web page authors use the recommended method for creating the hyperlinks.

Document Imaging

The District complies with Title 5 and other legal requirements for document retention. This involves archiving and retaining vast amounts of paper documents, which requires a significant amount of physical storage space in the college and district warehouses and in secure storage areas in various offices. Retrieving older documents is a time-consuming, inefficient process; one document can take an hour or more to retrieve.

As information needs and requirements grow, the challenges for file retention, storage, and retrieval will grow ever larger. The tasks of document management will grow more expensive and

time consuming.

A document-imaging solution would solve many of these issues. Electronic forms will allow students to submit requested information remotely at their own convenience. E-forms will reduce errors by using parameters to control submission requirements.

Many types of documents could be digitized, including:

- Transcripts—internal and external
- Applications
- Grade and class rosters
- Financial Aid documents
- Student Business Office—financial records
- Accounts Payable and Purchasing and other financial documents
- Payroll records
- Human Resources
- Student Education Plans (SEPs)

Digitizing has many benefits:

- Is a "green" computing initiative—reduces paper requirements
- Minimizes paper storage, reducing storage costs
- Eliminates manual, time-consuming searches for physical documents
- Improves employee efficiency by providing immediate availability of information
- Increases information security and reduces possibility of loss or destruction of originals
- Documents are available district-wide
- Facilitates articulation between the three colleges—needed for Title 5 compliance
- Enhances services to students
- Reduces human error by students and staff
- Provides greater access and reduces wait time for students

Resources: Requires significant IT and college staff time. The funding source will be the New Information Technology budget, with an estimated implementation cost of $200,000. Purchase e-forms module.

Several offices in the District use a document imaging solution from Hyland Software (formerly Hershey). Hyland is used for scanning and storing documents, predominantly in Admission and Records, and for storing SEPs. This system and the education plans are not yet accessible to the students.

Users reported that the Hyland Software has not been updated at SCCCD since Hershey was

acquired by Hyland, which has created browser-compatibility problems and limited functionality. The District Office IT Director has submitted a budget request to update the system to its latest version.

Software Acquisition Policies

The District Office identified key enterprise-wide software licenses and has been purchasing and managing license renewals, including Sophos Antivirus, Deep-Freeze, Turnitin, Net Support, Blackboard, and the Microsoft Campus agreement. The cost of the software is then allocated back to the campuses on the basis of their respective FTE counts.

Software at Fresno City College is requested using their Technology Request Form (TRF) process and is funded largely through the annual decision package request process. To ensure license compliance and appropriate technical support, publisher-provided and donated software is tracked through the lab set-up form process.

For Reedley College and the Centers, the recurring software is the responsibility of the Computer Services department. The Director submits an annual action plan, which is reviewed in a college-wide process for resource allocation. Smaller purchases are requested through the departmental budgeting process.

Because there is no single process or procedure to acquire and track software throughout the district, there is potential for inconsistent decisions, missed opportunities to leverage purchases, and licensing violations.

Software-Related Strategic Initiatives

This section proposes a set of software-related strategic IT initiatives to guide decision making during the five-year planning period. These initiatives, and others that may be proposed, will need to be prioritized by importance, impact, and prerequisite relationship with all other proposed initiatives.

Strategic Initiative	**Software-1: Implement Identity Management** *Select and implement an identity-management system and modify enterprise applications to use this system as the single source of application and network authentication.*

SCCCD has implemented Microsoft's Active Directory service but has not configured it to centrally authenticate and authorize users, except in limited cases. Currently, Colleague system, Blackboard Course Management System, email, and network access require separate identities (separate username/password stores, though usernames may be consistent by practice).

An identity management system manages the identity information of individuals and groups that are authorized to access institutional systems using a common set of protocols, policies, procedures,

and tools. Identity management can encompass the goal of single sign-on, allowing users to authenticate once and gain access to multiple systems such as the ERP, email, portal, and course management system.

Strategic Initiative	**Software-2: Maximize Ellucian Colleague** *Complete the hardware upgrade of the Ellucian platform and review and revise business processes to maximize the Ellucian Colleague administrative system.*

During the course of building the strategic IT plan with the SCCCD community, several faculty members, counselors, and staff identified operational problems with the Colleague student information system, suggesting that Colleague-related strategic initiatives be given high priority. These systems include the finance, financial aid, registration, admissions, degree audit, and budget modules, as well as the human resources and purchasing modules. The implementation of these modules would greatly benefit by a business process review.

This initiative also includes implementation of the hardware upgrades originally planned for 2013 but deferred. The District Office IT staff have acquired replacement hardware and expect to migrate Colleague to it in July 2014.

Strategic Initiative	**Software-3: Complete Software Inventory and Life Cycle Plan** *Complete a system inventory of all software licenses, terms, and condition, and the associated life cycle replacement plan and budget.*

Software life cycle planning recognizes the importance of software applications to work processes, the need to retain compatibility with installed operating systems, peripherals, and other applications, the need to carefully plan timely upgrades and replacements, and the need to manage software installations to comply with licenses. The first step in life cycle planning is to perform a complete system inventory.

Strategic Initiative	**Software-4: Develop a Software Acquisition Process** *Develop and implement a formal process for assessing, acquiring, and tracking software throughout the District.*

The District must take a systems life cycle approach to managing its software resources, ensuring technology decisions that are right for the District and Colleges, good buy-versus-build decisions, and institutional review at each critical stage of the product life cycle.

Currently, there is no single process or procedure to acquire and track software throughout the District, potentially resulting in inconsistent decisions, missed opportunities to leverage purchases, and possible licensing violations.

Strategic Initiative	**Software-5: Implement an Electronic Student Education Plan** *Design and implement an electronic student education plan (SEP), fully integrated with Colleague and securely and easily accessible by students and authorized counselors, faculty, and staff.*

California legislation requires every student to complete and have easy access to an updated student education plan (SEP). This initiative seeks to investigate and implement means of generating and storing electronic SEPs, potentially through a reimplementation of the Colleague degree audit functionality.

Organizational Structure

This section addresses the supporting organizational structure and services related to information technology, including governance, policies, security, IT support, and application development. The section also addresses the special support requirements for the District's web presence and the portal.

SCCCD is currently served by three separate IT groups:

- District Office: The Information Systems Department; led by the Director of Information Systems; and staffed by 12 analysts, programmers, technicians, coordinators, and specialists. Provides district-wide support for the Colleague ERP, telephones, network services, teleconferencing, and help desk services, and desktop support for the District Office and District Office North. Department Director reports to the Vice Chancellor for Educational Services and Institutional Effectiveness.
- Fresno City College: Fresno City College Technology Support Services Department; led by the Director of Technology Fresno City College; and staffed by 17 technicians, specialists, coordinators, and support staff. Supports campus computers, the campus network, classrooms, audio-visual services, shared file resources, help desk, and the Blackboard course management system for the campus. Department Director reports to the president of Fresno City College and also is responsible for supporting the Career and Technology Center.
- Reedley College: Reedley College Computer Services Department; led by the Director of Technology Reedley College; serves the College and three centers; and is staffed by seven technicians and specialists. Supports campus computers, the campus network, classrooms, audio- visual services, shared file resources, and the Blackboard course management system for the campus. Department Director reports jointly to presidents of Reedley College and the Willow International Center.

IT Governance

Governance provides structure and philosophic foundations on which decision-making is based. Technology leadership is responsible for collaboratively establishing and articulating the institutional vision and for maintaining forward momentum within the framework that governance provides.

Each of the colleges and Willow International Center have a Technology Advisory Committee (TAC) responsible for developing local college technology plans as well as providing advice in planning for acquisition, maintenance, and use of current and future technology throughout the College. The committee submits policy recommendations to the Strategic Planning Council, submits operational recommendations to the college president, advises the District technology committee, and recommends training activities for college staff and faculty in the uses of technology.

The District has also created a District Technology Advisory Committee that is charged with advising the Vice Chancellor for Educational Services and Institutional Effectiveness (representing the Chancellor's Cabinet) on strategic and operational IT issues and decisions, including major IT acquisitions, resource allocations, and planning. Strategic planning efforts are approved by the Chancellor's Cabinet and the Board of Trustees, with the concurrence of the Communications Council and the Classified and Academic Senates.

In addition, the Information Systems Priority Committee, an ad hoc committee composed of representatives from throughout the District, advises the District Office IT staff on priorities for Colleague-related initiatives. Each college also maintains a Distance Education Committee.

IT Governance Best Practices

The goals of effective, best practice technology governance include "providing strategic direction, ensuring that plans and objectives are achieved, assessing that risks are proactively managed, and assuring the enterprise's resources are used responsibly" (Selig). Best practice technology governance provides oversight and direction to ensure that technology management is aligned with the strategic direction of the institution. Technology governance also ensures that:

- Information technology policy and procedure is fairly and openly discussed, debated, and ratified by the institution.
- All constituencies within the institution have appropriate input into technology strategy.
- Areas of deficiency are identified and made known in an open and collaborative forum.
- Risks associated with technology implementations are identified and the institutional leadership provides guidance to the level of risk the institution is willing to accept.
- The information technology departments receive appropriate guidance and direction on priorities.
- There is an effective process for decision making on product acquisition. Product acquisition includes the critical issue of buy-versus-build, ensuring that custom development is limited to those narrow business requirements that are truly unique to the institution.
- There is an effective process for management of the technology portfolio. This includes the issue of in-source versus outsource of application development and support. The inevitable

turnover of the development staff through retirement and resignation coupled with inadequate system documentation can put an institution at risk with an applications portfolio supported by external resources.

- Instructional technology and classroom configuration issues are addressed in a manner that conforms to the academic schedule and requirements.
- Accountability for service delivery is established.

Technology governance includes a structure for effective decision-making and the associated policies and practices that emerge from the governance process. Communicating the results of the governance process is an important outcome of the process.

IT Support

An institution's IT support model addresses the relationship between its information technology systems and its community of users. The technology support model determines the quality of support users receive and impacts how successfully they can learn about and interact with their systems. In short, the effective and efficient use of all information technology resources depends on the structure of the technology support model used by the institution.

At SCCCD, the District Office IT staff are responsible for supporting the Colleague ERP, telephones, network services (including firewalls and wide-area network connectivity), video conferencing, and help desk services. The IT staff at the colleges and centers support campus computers, the campus network, classrooms, audio-visual services, shared file resources, help desk, and the Blackboard course management system for the campus.

Help Desk

SCCCD maintains several different uncoordinated help systems, plus a host of informal technology help relationships.

- The District Office supports a help desk for Colleague and WebAdvisor issues.
- The District Office maintains a help desk for telephone and network problems.
- Video and web-conferencing problems are directed to one individual within the District Office IT group.
- Fresno City College provides its local constituents with help and also supports a District-wide student help desk. Fresno City College uses the Dell KACE K1000 system management appliance for their help-desk portal.
- Reedley College and the Centers use the SolarWinds HelpDesk software for their help desk portal. Emergencies are handled by phone.
- Blackboard help is outsourced to Blackboard Presidium with 24×7 help desk coverage.

In practice, faculty and staff in the colleges report that they first call their local support person, who can often resolve their problems. Many faculty reported that they would more likely consult a "tech savvy"

colleague for assistance.

The library staffs also reported that students regularly bring technology problems to them, including WebAdvisor and Blackboard support problems, as well as problems logging into systems and setting up laptops. While recognizing that it has not been their defined mission, some expressed the opinion that, in the interest of student service, they have felt compelled to redefine their roles to provide application help to students. A few of the library staff reported that the help ticket system was cumbersome and inappropriate for simpler problems.

Users who were interviewed in the creation of this plan, while often lauding the individuals who ultimately provided them with assistance generally characterized the help desk system as "confusing," "unresponsive," and "ineffective." Several students and a few faculty complained that when they attempted to access the Blackboard Presidium help service, it was frequently "off-line" and unavailable to them. They also indicated that the Blackboard help desk does not follow up and resolve issues.

IT Support Best Practices

The growth and proliferation of technology in institutions of higher education has placed unprecedented demands on IT organizations. Much of the technology in common use is available at commodity prices, including desktop computers, laptops, data/video projectors, printers, wireless technology, etc. Institutions see technology as a pathway to becoming and remaining competitive. Faculty require a variety of technology resources to enhance teaching and assist in achieving learning outcomes. Students use technology to enhance the learning experience and to acquire marketable skills for the workplace. Institutions use technology as a marketing tool and resource to business partners and community groups. Administrators use technology to enable distance education initiatives and workforce development efforts and to build and maintain lifelong relationships with alumni.

All of these drivers—and more—define the need for well-supported technology. The challenge for institutions of higher education is to construct a robust, effective, and affordable technology support model. Without an effective support model, the investment in technology cannot be fully leveraged. An ineffective support model may result in faculty abandoning technology altogether and could drive an institution into a diminished competitive position in higher education.

The CampusWorks Community College Best Practice Technology Support Model relies on an interrelated and integrated set of components (technologies and services) accessed seamlessly through a single "front door," that is, the help desk. The help desk should include institutional professionals, virtual resources, and outsourced business partners. The successful technology support model includes:

- Standards: The key to cost-effective technology is standardization. Support staffs are more effective when they can develop a deep understanding of a limited set of support requirements rather than a shallow understanding of a broad set. Commodity purchases of desktop equipment from industry leading vendors provide the lowest total cost of ownership. Standardizing on hardware configurations enables standard software

configurations, including a single release of desktop operating systems, office productivity suites, and other standard software products.

- Robust Network: Any technology-related work that is done on behalf of the institution will eventually be communicated, deployed, or used on the District network. An effective support model must begin with a well-functioning network. If the network is unstable or slow, an effective support model is not possible.
- Solid Technology Infrastructure: Infrastructure includes the servers, network operating systems, printers, wireless networks, email systems, antivirus, antispam, firewalls, etc. That is, infrastructure is a collective term for all of the pieces of technology that are provided to and used by the community. The role of infrastructure in the context of the support model is to provide stability, reliability, availability, performance, and ease of use. From the perspective of the user, the infrastructure is good if one is unaware that there is anything wrong; it is bad if something that should work does not. The goal of a high quality IT organization is to provide good infrastructure.
- Robust Classroom Infrastructure: The historical model of supporting classroom technology involves delivery of equipment on a demand basis. This model derives from the historically high unit cost of equipment and the historically low training and adoption levels of technology in teaching and learning. Both of these business drivers are now out of date. There is no budget model that can justify paying staff to deliver low-unit-cost equipment. Best practices dictate establishing classroom design standards and installing equipment in all classrooms. Technology must be present and functioning when the faculty member enters the classroom. Reliability is greatly enhanced by strict adherence to adopted standards and permanent installation of technology in all classrooms.
- Universal email: An important best practice is the provision of reliable electronic communications to all members of the District community, including students, faculty, and staff. The institution should standardize on a single email product and collaboration suite.
- Identity Management: Identity management is a technology and infrastructure framework for managing information about people, namely, students, faculty, staff, and various supporting entities such as vendors, partners, and consultants. The goal of identity management is the implementation of a single and authoritative source of information about people and their relationship to the technologies that they use. Industry data indicates that roughly 70% of the cost of the support model is in the management of user IDs and passwords. Identity Management implements a single user ID/password file for authentication and provides a single authentication point so if a password is changed, the new password is immediately available for all of the applications that the individual uses.
- Centralized Desktop Support: Best practice recommends implementation of standard software using a centrally-managed software image product. An outcome of this activity is that staff need to make fewer “house calls.”
- Life Cycle Approach: Industry data demonstrate that the cost of using technology increases with the age of the equipment. The highest cost for old equipment is in the support model. Best practice recommends that institutions adopt a life cycle management strategy for all technology equipment, with user computers and classroom technology as the highest

priorities. The life cycle management assigns a specific life span to a piece of technology based on industry-standard data of the cost per year of ownership. The life cycle approach begins with a complete centralized inventory management system. The system should also embrace software, including strategies for managing licenses and keeping software products up to date.

- 24×7 Support: Technology support needs to be present during the academic service delivery hours of the institution. Faculty using technology in classrooms need a support model that includes professional on-site presence, typically requiring the help desk to be staffed about 72 hours per week. However, in an age of 24×7 Internet access and asynchronous teaching and learning, institutions need a 24×7 support model (168 hours per week). This is especially true for distance learning programs and courses, but increasingly true for hybrid and traditional face-to-face course offerings. At most institutions that have implemented a robust course management system, even for traditional face-to-face courses, access is literally "around the clock." Because few institutions can afford to provide 168 hours per week of on-site support, they should supplement their on-site support with an outsourced 24×7 help desk by partnering with service providers in this marketplace who focus on higher education.
- Knowledgebase: The knowledgebase is an electronic repository of best practice solutions to common problems. A knowledgebase is an invaluable tool as a component of an effective support model, enabling the help desk staff to provide the same high quality answer each time the question is asked and independent of the particular staff member who fields the call. The knowledgebase can serve as a rich repository of useful information that is unique to the institution.
- Help desk management system: A help desk management system provides management and tracking tools for IT support staff and self-service tools for end users (students, faculty, and staff). Along with a knowledgebase, the help desk management system provides support staff with clear, common information.
- Staffing: The heart of an effective support model is a well-trained staff that has the tools necessary to do their jobs. An effective support model begins with creating a technology environment that can be supported. The other components of the recommended support model are all necessary to achieve the starting point of an effective support model, defining a scope of responsibility that a trained and motivated professional staff can support effectively. All members of the IT staff should have a documented training plan derived from the requirements of the job description and the skill level of the staff member and monitored by supervisors as a part of the performance review process.

Assistive Technologies

Each campus has an active Disabled Students Program and Services (DSPS) department. The individual DSPS departments coordinate through a central contact. The DSPS groups are heavy

users of Colleague and its reporting database, and deliver several technology-related services, including:

- Adapted classroom equipment
- Adjustable classroom tables
- Braille version of written materials
- Computers with optical character recognition (OCR)
- Computers with voice output
- Interpreters for the deaf or hearing-impaired
- Mobility assistance on campus
- Note takers
- Readers for the blind
- Taped or electronic texts

Network and Access Policies

The remote access server is managed through the District Office. This technology allows the remote user to access selected services normally available only to those who are physically located on campus. Employees connecting to this server must use District-owned equipment unless it is a short term technical support function being performed by a vendor. Access is restricted to some IT staff personnel, senior administrators, online counselors, and a limited number of off-site student registration activities.

Security

Physical access to network and server resources at Fresno City College is restricted to Technology Support Services and Building Services staff. Fresno City College is also using environmental controls monitoring on their UPS units in the data center and wiring closets.

About half of those wiring closets are also under surveillance for entry with motion-activated cameras and two-way radio. A budget request has been submitted to complete the remainder.

Fresno City College campus computers require password authentication. Passwords must be reset every 180 days. As a rule, end users do not have local-administrator access to their college-provided computer. All Fresno City College computers have antivirus software with automatic updates for Microsoft.

The District operates a Palo Alto firewall through which all District traffic is sent and received. The District uses Cisco surveillance cameras and media servers. The system is aging and in need of evaluation for replacement.

Support for Work Processes

Work processes are observable, interrelated work activities that use input, in a pre-defined sequence, to produce output. All of the productive work performed in the District and Colleges,

whether academic, student services, or administrative, is the result of work processes.

In a typical hierarchical organization, work processes are organized and managed in a series of functional areas, each responsible for optimizing the performance of their job function, and held accountable for the functional area's efficiency and effectiveness. Although all of the steps in a given work process may be contained within one functional area, most work processes are cross-functional, spanning multiple functional units.

Work Process Analysis and Improvement

Process analysis involves an in-depth review of existing work processes in functional offices with an aim toward improving or re-inventing those processes to improve their efficiency, effectiveness, accuracy, and performance, typically using technology as an enabler.

Often, processes that once made sense in relation to manual or legacy information systems are discovered to still be in use at institutions despite new capabilities offered by their administrative ERP systems. This can cause duplication of effort, unnecessary manual procedures, and unreasonable dependencies upon particular staff. The process analysis effort involves identifying and delineating these processes and improving or reengineering those in need of remediation, along with creating appropriate documentation of new standard operating procedures.

Process analysis and review is necessary to understand how things are or should be done. Business Process Reengineering (BPR) seeks to re-invent processes to achieve dramatic improvements. It is not driven by technology, but technology is often essential for a successful implementation. In its absence, software acquisitions often are relegated to the bottom of a long project list because users and technicians do not understand desired outcomes.

Work-Process Support Best Practices

A best practice approach to addressing the District's work processes is to complete a comprehensive process analysis to identify areas where either the system rules or the business process should be changed to meet institutional goals. A comprehensive post- implementation ERP review often is coupled with this effort, using experts in the ERP system to identify and correct configurations that can improve the service delivery to all of the ERP system's constituents. This activity must, by definition, review policies and procedures to identify what may be driving the current system configuration or answer the question "why do we do it this way?"

Where a gap exists between functionality and practice, the District has several choices:

- Examine its work processes to determine whether process and software can be aligned.
- Work with the ERP vendors to add the necessary functionality to the baseline product.
- Develop a local solution, following the vendor recommendations for adding such customization.
- Determine whether a report would provide the needed data.

Ideally, the ERP systems are fully implemented and well-integrated with other systems, such as the student system with the course management system. Major barriers to improving productivity might include fragmented data systems as well as the silos created by tradition, interest groups, and funding programs. When those responsible for a given function are isolated from others within the same organization, they tend to develop practices and procedures that are optimal only from their own perspective. In addition, decisions made in one area of an organization may create tension because they conflict with decisions made in another.

To ensure better alignment in decision making, the District should develop process-redesign teams that cut across functions and follow the process rather than looking at work flow only within a given office. In addition, federal and state policies and regulations should be reviewed to identify and remove barriers to more efficient use of resources. Policies also should be reviewed to remove practices that keep technology functions isolated from the functions of teaching, learning, and assessment. These include separate funding streams and restrictions on the use of funds that reinforce the isolation of the educational technology function.

Organization-Related Strategic Initiatives

This section proposes a set of organization-related strategic IT initiatives to guide decision making during the five-year planning period. These initiatives, and others that may be proposed, will need to be prioritized by importance, impact, and prerequisite relationship with all other proposed initiatives.

Strategic Initiative	**Organizational-1: Hire a District Chief Information Officer** *Create and fill a cabinet-level position of District Vice Chancellor for Information Technology (Chief Information Officer).*

During the creation of this strategic IT plan, discussions throughout the District strongly reiterated the need for strong central IT leadership at the District level. Except for the desire for single sign-on, the creation of a Chief Information Officer role was the most requested need across all of the faculty, staff, and administrators who participated. As evidence for this need, participants noted differences in service levels, technology solutions, and IT policies between the institution's campuses. Beyond being key, it should be immediate; without someone full-time on the Cabinet in this role, many of the plan's most important initiatives will be exceptionally more difficult to achieve.

Strategic Initiative	**Organizational-2: Hire a District Chief Information Security Officer** *Create and fill a Chief Security Information Officer with District-wide security responsibilities for data, networks, and personal information.*

With steadily increasing security threats, institutions have begun to create new roles to help protect their applications, data, networks, and personal identities. The evolving roles of Chief Security Officer

and Chief Information Security Officer help direct efforts to reduce information and information technology risks and protect institutional information assets. This role is most appropriate at the District rather at the College or Center level.

Strategic Initiative	**Organizational-3: Consolidate IT Staffs** *Initiate a study to determine the costs, benefits, and service implications of merging SCCCD's separate IT staffs into one coordinated unit under a CIO.*

The current organization of SCCCD into three separate IT staffs is counterproductive and wastes valuable limited human and technical resources. Though IT staffing levels overall may be low, especially at the Centers, a more-detailed analysis must be made to determine the need for additional staff resources in the areas of network engineers, instructional technologists, instructional designers, security analysts, and service desk technicians.

The consolidation of IT staffs across the District must be accomplished in a way that will retain and improve local support at the Colleges and Centers. The consolidation will allow key applications and services to be centrally managed as mission critical enterprise services, including the network, Blackboard, Millennium (soon to be replaced with OCLC WorldShare Management Services), Hyland imaging and document management, SARS, CurricUNET, and TutorTrac.

Strategic Initiative	**Organizational-4. Articulate Information Systems Principles** *Articulate an institutional information systems philosophy and set of guiding IT principles.*

This SCCCD strategic IT plan is based on an IS philosophy and vision as well as a draft set of IT principles. The principles do not dictate specific operational solutions, but rather, provide a strategic context within which operational IT decisions can be made. This IS architecture serves as a set of guidelines for making informed decisions about information systems issues, acquisitions, implementations, and ongoing support and maintenance.

Well-defined information systems principles should be determined through a process that engages the entire District community, seeks consensus, and is regularly reviewed and updated for appropriateness and relevance. This process was begun during the creation of the District's initial IT strategic plan, but is not yet complete.

Strategic Initiative	**Organizational-5: Develop a District Operational IT Plan** *Develop and implement a one-year tactical/operational IT plan for FY 2014-2015, aligned with the strategic IT plan.*

Strategic IT planning is intended to provide the "big picture" of information technology at an institution. That is, it provides a high-level set of guidelines for IT decision making and tactical planning. Strategic plans typically look up to five years ahead to lay the foundations to fill anticipated IT needs. The view is high-level, without sufficient detail to deal with every nuance of the future, yet with enough detail to clarify intent. The five-year strategic plan aligns closely with the institutional strategic vision, mission, and goals and should drive similarly-aligned annual tactical/operational plans. These one-year tactical/operational plans contain the implementation details required to realize the goals of the strategic plan. They also inform and update the directions outlined in the strategic plan.

Strategic Initiative	**Organizational-6: Develop a Best-Practice Support Model** *Develop and implement a best-practice technology-support model for all technology support.*

Throughout the 2011 information technology assessment as well as the District strategic IT planning process, the separate IT staffs, while often praised for their helpfulness, were sometimes criticized for both "can't do" and "arrogant" attitudes, suggesting a lack of focus on customer service. The District should develop and implement a best practice technology support model. Such a support model, along with associated organizational changes, will support the District's desire for a more responsive, accountable, and effective suite of District-wide technology services.

Essential components of this best practice support model include:

- Sufficient IT staffing levels and professional development programs
- Help desk configuration and support
- Identity and access management for efficient account provisioning
- Network-based service delivery
- Inventory management and life cycle replacement
- Desktop software standards
- Centralized desktop management
- Classroom technology standards
- 24×7 support
- Knowledgebase availability

Strategic Initiative	**Organizational-7: Institute a Project Management Function** *Institute a project-management methodology and function.*

Projects are unique, specialized activities designed to deliver a product or service. Projects are not "business as usual" and require specialized skills, methods, and processes for their successful completion. Project management is the art and science of bringing projects to fruition within schedule and budget.

This initiative seeks to develop and implement a project management function for the District, including defining a methodology and process and developing a project management culture and skill set that will optimize project success and performance. An effective project management function is critical to the realization of the initiatives proposed in the IT strategic and tactical plans.

Strategic Initiative	**Organizational-8: Reassess and Revise Business-Continuity Plans** *Develop, implement, and test business-continuity and disaster-recovery plans.*

The District leadership should engage in a process that prioritizes the applications that must be available if the data center goes offline. This prioritization, which typically yields communication (website, email, and phone) and the academic environment (Blackboard and video conferencing) as the top priorities and administrative systems as lesser priorities, assists both in the implementation as well as the budgeting for this service.

Strategic Initiative	**Organizational-9: Create Information Security Plans** *Develop, implement, and test data and information security plans.*

The District must perform a detailed security assessment addressing network access, log-in and password systems, data protection, physical vulnerability, and other security considerations at the institution. The assessment should include a detailed inspection of the institution's data centers, servers, network switch closets, staff work spaces, computer labs, classrooms, and public kiosks, as well as general vulnerability testing and programmatic-probing of the servers and network equipment for known security weaknesses using industry standard analysis tools. The security assessment must include an evaluation of training efforts directed at members of the community regarding security awareness. Often, organizations diligently work to secure their electronic doors only to have them left open by employees who are not fully aware of how intruders might exploit their security behaviors (or lack thereof).

Strategic Initiative	**Organizational-10: Improve Institutional Compliance** *Review and improve the institution's PCI and PII compliance.*

Every organization that accepts credit cards for the payment of goods and services must ensure that their procedures, record keeping, and technical infrastructure comply with payment card industry (PCI) standards. Institutions that do not comply risk serious financial repercussions. Institutions also have the responsibility to ensure the integrity and security of personally identifiable information (PII).

Strategic Initiative	**Organizational-11: Improve Web Presence** *Improve the design and consistency of the District's and Colleges' web presences.*

The District's website provides information to both internal and external audiences and helps to market the District and the Colleges. The District should work to develop a comprehensive and integrated strategy for delivering content, communicating with all constituents, and providing services to students, faculty and staff. This will include:

- Upgrade or replace the current content management system implementation to enable a consistent web interface with a best-practice approach to distributed content management.
- Analyze what content should reside on the public website versus what should be housed internally on an intranet and/or portal.
- Evaluate and develop strategies associated with the use of social media.

Strategic Initiative	**Organizational-12: Improve Online Service Delivery** *Analyze and improve the usability and functionality of online services to all District constituents.*

Online service delivery is an expectation of nearly all District constituents. Students, faculty, and staff expect to be able to perform most transactions through the online services of the District, and, increasingly, via mobile devices. Community constituents, prospective students, employers, alumni, and donors all expect to interact with the District through its online presence. In many cases these requirements can be facilitated through the implementation of one or more industry standard portals, developed in close collaboration with the District's many constituencies, combined with web-services enhancements to the ERP.

Typically such a solution would begin with the implementation of services for current students. These services would include many already in the WebAdvisor portfolio, but presented in a more modern and approachable way. These services should consolidate both the typical student services (grades, bills, financial aid, registration) as well as emerging best practices associated with early

alerts, educational planning and e-advising.

Faculty and staff services would include the typical human resources and payroll services expected by most employees, and can be expanded to include interfaces into other systems of interest. Faculty and counselors should have access to the appropriate student information to support advising, as well as to post their office hours, review their teaching schedules, and request services.

Integrated service delivery to all constituents is feasible as the District aligns its software implementations, integrates its thinking about service delivery, and considers its service delivery from the point of view of its constituents. This will include:

- Implement a best-practice service delivery platform through a modern portal interface for students, faculty and staff. This effort should consider the existing Blackboard portal (Community System) and Ellucian options as well as other portal products that can interface with Colleague.
- Evaluate and develop a Customer Relationship Management (CRM) implementation, with a focus on strategies to address specific communication requirements throughout the student life cycle and beyond with SCCCD alumni.

Strategic Initiative	**Organizational-13: Implement a District Portal** *Identify ideal portal requirements, analyze available alternatives, and select, acquire, and deploy a District-wide portal.*

After the District implements a District-wide identity management system, the next highest requested need is for a portal that would enable users to seamlessly connect to all of the institution's systems from a single website and after a single user authentication. Portals also typically present relevant information to the user based on the user's known characteristics (such as department, status, group membership, etc.) and allow the user to tailor the look, feel, layout, tools, and links that are available upon successful login.

The District has already licensed the Blackboard Community System, but has not fully deployed it as a portal. This is a logical candidate for a student and faculty portal because many students and faculty already spend considerable time on the site on a daily basis, making it a center of their academic work. This effort should consider the Blackboard portal and Ellucian options as well as other portal products that can interface with Colleague.

Strategic Initiative	**Organizational-14: Consolidate the District's IT Help Services** *Consolidate the District's IT help services and deploy a functional help desk application that supports tracking, reporting, and knowledgebase creation and publication.*

The multiple help systems currently in place throughout SCCCD are not effective, creating uncertainty and frustration among users as well as delays in attaining assistance.

Strategic Initiative	**Organizational-15: Analyze and Improve Work Processes** *Create an inventory of all District work processes (related and unrelated to the Colleague ERP), create cross-functional teams, map current work processes, identify process disconnects, and design more effective envisioned processes.*

The District can improve the efficiency and effectiveness of its work processes by completing a comprehensive process analysis to identify areas where either the system rules or the business process should be changed in order to meet institutional goals. To ensure better alignment in decision making, the District should develop process-redesign teams that cut across functions and follow the process rather than looking at work flow only within a given office. In addition, federal and state policies and regulations should be reviewed to identify and remove barriers to more efficient use of resources. Policies also should be reviewed to remove practices that keep technology functions isolated from the functions of teaching, learning, and assessment.

Strategic Initiative	**Organizational-16: Institute Technology-Related Professional Development** *Design and implement a formal professional development program for faculty and staff in the use of supported technologies.*

Investing in technology without investing in the people who use the technology is not cost effective. The District must educate, train, and support its users to enable them to become technologically literate. While offering face-to-face and online training programs is part of the solution, the District must also acquire or build just-in-time self-instructional training materials, provide accessible context-sensitive help and reference materials, and ongoing user support. The District must also promote an environment that encourages, supports, and rewards professional development for all faculty and staff within an organizational culture of continuous improvement.

Strategic Initiative	**Organizational-17: Expand Student Access to Networked Computers** *Analyze the current availability of student computing and implement solutions to expand access.*

Input and feedback from students, faculty, and library staff indicate that students often find it difficult to access computers on the District's campuses. This initiative seeks to analyze the current provision of networked student computers and implement solutions to expand student access, possibly including extending computer lab staffing and hours, providing a larger pool of loaner laptops, provisioning additional nonclassroom learning spaces, or acquiring additional student computers.

Instructional Technology Infrastructure

This section outlines the status of the District's instructional infrastructure components of the strategic IT plan, including support for instructional technologies, teaching and learning spaces, and distance education.

Support for Instructional Technologies

Local/Synchronous Technologies

Presentation—Most District classrooms (≈95%) have built-in data/video projection systems across all of the district's campuses. Only a few built-in wide-aspect-ratio projectors were observed, mainly at Willow AC-2. Willow AC-2 is one of the few buildings that can accommodate the 16:9 format, because its rooms are equipped with projectable white boards.

No 3D projection systems or multiple-image projection systems were observed. A few portable Epson projectors were observed with wireless projection capability. A few portable Epson projectors were observed with HDMI interfaces to projection systems, but no classrooms were observed with HDMI interfaces at the instructor workstation.

Most classrooms (≈85%) provide a built-in computer for the instructor.

Some rooms at Fresno City College in Business Education and the Old Administration Building have classroom annotation devices. Some faculty members alluded to mobile SMART boards that could be made available. Some faculty members at FCC use the Doceri application on the iPad platform as wireless annotation tablets.

No LCD Touch Panels as projector preview monitors were observed. Many classrooms provide a VGA cable at the instructor workstation for "wild" devices such as laptops and mobile devices to interface with projectors.

Most classrooms are equipped with whiteboards and some projectable whiteboard surfaces. Less than half of the classrooms support document cameras. Overhead projectors are still in use throughout the District.

Engagement—A small number of faculty reported using the iClicker and Turning Technologies student response systems ("clickers"). No virtual clickers were observed.

Faculty and students report spotty wireless coverage in classrooms on all campuses.

No use of interactive games and activities was observed.

Engagement for Collaborative Work—Most of the classrooms reviewed had movable tables and chairs, often with wheels, to accommodate alternative classroom configurations.

No classrooms had computer displays usable by multiple students to support break-out groups for problem-based learning.

Capture—No built-in audio-lecture capture or video-lecture capture facilities observed in classrooms. No activity discussed or observed. Some use of Camtasia for screen annotation capture and for screen animations with audio capture.

For rich-media capture, the District formerly licensed the Tegrity product, but this has been dropped. No activity discussed or observed. No rich media capture with synchronized student notes, and no rich-media capture with user edit capability.

No activity discussed or observed for "flipped" classroom (student) recordings for feedback.

Local/Asynchronous Technologies

The local/asynchronous quadrant covers situations where students gather together in the same space, but do not work together simultaneously as a class.

Supervised Testing Systems—Supervised testing systems are useful for providing secure administration of placement exams, achievement exams, departmentalized testing, distance learning exams, and classroom makeup exams. Some institutions support self-paced standard classroom testing to free-up the instructors' time for teaching activities instead of testing activities.

Fresno City College supports an assessment center that administers placement tests for math and English, as well as English-as-a-Second-Language (ESL), Computer Familiarity Test (CFT), and DSP&S tests. The Assessment Center is not used for on-campus or distance-education exams. It is experimenting with providing make-up testing services, formerly provided by the Tutorial Center. Reedley College, Willow International Center, and Madera Center have assessment centers with similar offerings.

Several computer classrooms are licensed to use the NetSupport computer classroom management product.

As noted above, Fresno City College supports an assessment center that administers placement tests for math and English, as well as ESL, CFT, and DSP&S tests. The assessment center is not used

for on-campus or distance-education exams. None of the campuses uses automated remote-testing systems.

Distant/Synchronous Technologies

The distant/synchronous quadrant includes technologies that support location-independent real-time interaction and collaboration.

Video Conferencing Systems—Videoconferencing has become a normal technical/cultural experience for collaboration across the campuses and centers for noninstructional purposes; programmatic instructional applications have been limited and are declining.

The District supports 30 videoconferencing installations across seven of its eight sites (excluding only the Career and Technology Center). The video-conferencing facilities range from conference-room to classroom configurations. About one-third of these 30 video conferencing facilities are listed as "distance education classrooms." Most of the District equipment is capable of multipoint conferencing, allowing up to four sites to participate in a single conference by sharing bandwidth through the existing codecs.

At least one-fourth of the video-conferencing Polycom codecs have HD capabilities, but network bandwidth and QOS do not seem sufficient to support it.

Web Conferencing Systems—The District has free access to CCC Confer, an Elluminate-based web-conferencing service. The free service includes VoIP and telephone conferencing capabilities. This service has been adopted in relatively small numbers at both the Fresno City College and Reedley College and somewhat less so at the Centers. The solution is not integrated with the District's Blackboard system; doing so would allow its seamless integration into the course managements system as a synchronous communication tool.

Other Collaboration Systems—Some faculty members seem to use externally-hosted Web 2.0 collaborative technologies.

No use of multi-user virtual environments (MUVEs) was observed.

Distant/Asynchronous Technologies

The distant/asynchronous quadrant includes technologies that facilitate information **presentation**, communication and **collaboration**, **interaction**, and teaching/learning **support** in the mode where teacher and learner are separated by both time and location.

Presentation—At SCCCD, asynchronous presentation tasks are addressed primarily through Blackboard and some limited usage of the Camtasia screen capture solution. At Fresno City College, there is some use of iTunesU and YouTube Channels. Internally-hosted streaming services are limited to Camtasia.

The District does not support any formal, institutional cloud-based systems and services. As part of the institution's Microsoft Office 365 subscription, individual enterprising students can take

advantage of the Microsoft's OneDrive (SkyDrive) cloud-based file system. Whereas no faculty reported using this capability for instructional purposes, a few reported using Google Drive to share materials with students. For document management, faculty have access to shared network drives when on campus. Instructors share documents with students through Blackboard and occasionally use private systems such as Google Drive.

Collaboration—Many stable asynchronous collaboration applications are available to support instructor-to- student and student-to-student communication and collaboration. SCCCD faculty have access to wiki, blog, and discussion board tools within the Blackboard Learn system, with access limited to each individual class or instructor-defined group of students. A very small number of faculty also might be using public blogging resources such as WordPress and Blogger.

Interaction—This niche encompasses the use of CAI/CBT tutorials, simulations, and advanced screen capture applications capable of interaction and branching (such as is possible with the Camtasia Studio, Captivate, and Articulate applications). At SCCCD, a small number of faculty use publisher-based simulations in their classes.

Support—Instructional support applications include systems that bundle online instructional applications and provide tools to manage the instructional process. The predominant technology in this area is the course management system, which has emerged from modest beginnings in the late nineties to become a mission-critical application today. The District also has implemented several other instructional support applications within the Blackboard course management system, using the Blackboard building-block interface.

Course Management System—SCCCD uses the Blackboard course management system. Originally implemented locally at Fresno City and Reedley Colleges in 2000, the CMS now is hosted by Blackboard and includes a 24×7 help-desk function delivered by Blackboard Student Services (formerly Presidium). Both the Blackboard Learn and the Blackboard Community systems are included in the license.

The Blackboard CMS is integrated with the District's implementation of the Colleague student information system, automating the creation of all course sections for each academic term, the creation of student users, and the enrollment of instructors and students into course sections, all best practices of course management system administration. Grades and quiz scores are not currently fed back to Colleague as part of this integration.

Course sections are created as blank shells and faculty are responsible for populating the course content. No College- or program-specific course templates are being used. Faculty who previously created their courses in Blackboard can use the "course copy" feature to copy content, assessments, and other components from previous courses into their new term-specific course shells. Faculty also can archive/export their course materials to a local compressed (ZIP) file as a backup.

Although course shells are automatically built within Blackboard every term for all courses District-wide, faculty and students estimate that about 50% of these sections actually use Blackboard and system administrators confirm that about 50% of the course sections created within Blackboard

have been manually made available by their instructors. (By default, course sections are created in a mode that is unavailable to students.) This adoption rate is not high compared to other institutions using Blackboard for over 12 years.

Students reported that some faculty refuse to use Blackboard and others seem put off by its complexity and technical/time demands. Blackboard adoption seems to vary greatly by campus and by academic discipline, with high adoption rates in the business areas. A sampling of students from Reedley College reported than none of their Blackboard course sections uses collaborative features such as the built-in wiki and blog, none uses the newer "mash-up" capabilities, and only about one-third use discussion boards. All students reported that their Blackboard sections use quizzes, up dramatically from the 20% number recorded in similar interviews in 2011.

The vast majority of students, across all campuses, reported that Blackboard was very helpful when instructors used its features, but indicated it would better serve them if courses were designed more consistently, stating that the location of syllabi, assignments, readings, etc. are different across multiple courses and therefore difficult to use. Nearly all students expressed the desire that every course section provide a Blackboard presence.

The Blackboard implementation utilizes a number of extensions via Blackboard's building block technology, including:

- Merlot (learning object) search and integration
- Online Attendance
- Publisher interfaces
- Respondus Lockdown Browser
- Turning Technology
- Turnitin
- Who's Online

The Blackboard Mobile Learn application is available at SCCCD in its "free" mode. That is, students and faculty can only access Blackboard via their mobile devices (iOS, Android, and Blackberry) when connected to Wi-Fi. In order to be able to access Blackboard from their mobile data plans, the institution must license the product from Blackboard for an annual fee. Only a small percentage of the students who were interviewed knew of the app's existence and some indicated that it performed poorly and gave unpredictable results. Nonetheless, nearly all expressed the desire to use mobile applications to access Blackboard and Colleague, as well as campus event information.

Academic Portal—a portal is a web page that can be dynamically-configured based on user preferences and data from institutional databases. Portals typically require user authentication and usually provide authenticated access to other associated enterprise Web sites. In the academic world, portals can provide unified access to student information systems, course information systems, and academic, financial, social, and technical service systems.

The Blackboard Learn system currently deployed at SCCCD has been extended to include the

Blackboard Community System. Academic portal functions can be partially addressed using the Blackboard Community System. The community system can provide the following functions, among others:

- Institutional roles: The Community System can, based on data received via integration with the student information system and other sources, tag individual users with designated institutional roles. For example, an individual can be associated with the role of student, new student, math major, psychology minor, member of the chess club, etc.
- Organizations: Organizations provide all of the functionality associated with courses in Blackboard, but are populated with leaders instead of instructors and participants instead of students. Organizations are typically used in support of student, faculty, or staff groups. For example, a counselor could lead an organization in which all of his/her advisees are participants.
- Customizable Modules: Users can add modules ("widgets," "gadgets," or "applets") such as calculators and customized news feeds to their portal page.

In institutions with advanced Blackboard Learn implementations, the primary advantage of the Blackboard portal is its integration and proximity to the course system which serves as the course "hub" for day-to-day student academic activity. This "academic portal" function is ideally situated within Blackboard because, for most students and many instructors, it is the most-visited Web site throughout the course of a given semester.

At SCCCD, Blackboard organizations are routinely used for many faculty groups and a few student groups. SCCCD has not utilized custom roles within Blackboard driven from information obtained via integration with Colleague. There are no statistics available on student use of other portals features such as customized modules.

The Willow International Center was reported to use EduStream for streaming services.

Support for Teaching and Learning Facilities

The District's teaching and learning facilities are mission critical to its success, and consequently should be a high priority for IT support. This importance translates to the need to provide current, reliable, well-maintained, documented, and supported technologies in all of the spaces where teaching and learning occurs.

Classrooms

Classrooms are generally equipped with data/video projectors, networked computers, and multimedia source equipment (DVD/VHS players) either directly connected to the projectors or routed through a media switch. Written classroom design standards were available in the Fresno City College IT plan in the form of a list of equipment types for three different classroom configurations.

Classroom design was generally inconsistent across and within campuses. At Fresno City College and the CTC, many rooms do not provide built-in computers (~25%); at Reedley College, Willow

International Center, Madera Center, and Oakhurst Center, they are provided in nearly every classroom. A similar situation exists with the use of A/V switches. An A/V switch allows the instructor to easily select from several input sources, typically prewired into the switch, and direct their output to the data/video projector. Various vendor offerings were identified, including Extron, Crestron, and SP Controls, but many classrooms are without A/V switches and rely on projector remote controls. Some classrooms have document cameras and SMART annotation devices.

Figure 3—A/V switch adopted at Willow Center.

With the exception of Academic Center 2 at Willow International Center, nearly all built-in data/video projectors and screens at SCCCD support 4:3 display ratios, not wide screen (16:10 or 16:9). Academic Center 2 has prepared for the advent of 16:9 aspect-ratio projectors by equipping most rooms with projectable whiteboard surfaces instead of projection screens.

Across the District, 95% of the available 358 classrooms contain a data/video projector, 85% provide an instructor computer, 45% provide a document camera, and 76% support an A/V switch.

Table 5—Built-in Classroom Technology at SCCCD

Site	Classroom Count	With Projectors	With Computers	With Document Camera	With A/V Switch
Fresno City College and CTC	175	94%	75%	59%	69%
Madera Center	44	93%	93%	23%	93%
Oakhurst Center	10	100%	100%	100%	100%
Reedley College	77	94%	94%	14%	65%
Willow International Center	52	98%	98%	54%	98%
Total (all classrooms)	358	95%	85%	45%	76%

The classrooms in Willow Academic Center 2 exhibit several desirable classroom design features, such as:

- An installed data/video projector in wide-screen aspect ratio.
- Projectable white board surface to accommodate wide-format projection.
- Zoned lighting to reduce the amount of room lighting falling on the projected image

(improving image quality).

- Teaching station with A/V controls, built-in computer, preview monitor, document camera, and support for "wild" input (e.g., from an instructor's laptop or mobile device).
- Telephone for emergency and classroom-support contact.

Faculty, especially at Fresno City College, reported that classroom technologies were generally inconsistent from room to room and did not always perform reliably. For example, in contrast to the Willow AC-2 design, over 20% of the observed classrooms throughout the District have no teaching station and consequently, no usable projector preview monitor. Given the option, very few instructors would prefer teaching from the corner of the classroom with their back to their students.

Figure 4—Willow Academic Center-2 classroom with newest design.

Figure 5—Willow Academic Center-1 classroom of older, corner-facing design.

Nonclassroom Learning Spaces

Institutions of higher education are increasingly realizing that learning does not take place exclusively in the classroom, but can be effectively encouraged and supported in well-designed nonclassroom learning spaces. These include quiet study carrels, group work areas, and technology-supported social spaces, typically equipped with power outlets for charging computers and mobile

devices and good coverage with wireless access points.

There is no central inventory of nonclassroom learning spaces at the District's colleges and centers, but spaces seem limited to the campus libraries and student centers. The librarians throughout the district expressed the desire to provide additional nonclassroom learning spaces within their facilities, under a "learning commons" approach.

Best Practices for Teaching and Learning Facilities Support

Several factors contribute to the successful classroom technology and learning space implementations:

- Clarity on what constitutes the default classroom technology configuration. The decision-making process on classroom standards is collaborative, combining the faculty and programmatic requirements with the technical knowledge.
- Agreement on what classrooms need to be configured to support specific specialized content requirements, such as graphic arts, CAD, or network engineering, and how those classrooms will be supported.
- Opportunities to test and adopt different technologies to enhance the teaching and learning environment, including document cameras, clickers, annotation boards and panels (such as the SMART Podium), tablets and other emerging technologies.
- Software decisions made through the appropriate governance process and implemented through careful license management.
- Classroom technology support that is understood to be production-critical, with coverage provided during all or most class times.
- Regular replacement of technology through a well-defined and understood life cycle replacement practice.
- Professional development opportunities and incentives for faculty to explore, learn, and adapt their teaching to include technologies appropriate for their disciplines.

EDUCAUSE reports that community colleges typically equip 80% of classrooms with basic technology including a wired internet connection, a computer, and a data projector. Nearly 70% of AA institutions have 4-year or less computer replacement cycles (EDUCAUSE, 2009).

The SCCCD classroom environment differs widely at each of the campuses. The newer buildings at Willow International Center provide faculty with a consistent design and interface, but significant differences still exist across buildings and campuses. Fresno City College has the largest and most diverse and inconsistent classroom environment, with the lowest percentage of built-in computers and A/V switches.

Support for Distance Education

Some campus administrators plan for a five-year technology replacement cycle, but do not budget the plan, rendering it little more than a wish list.

At SCCCD, the distance education effort is currently focused on supporting students within the District's four-county service region, from which the vast majority of its students originate. The emphasis is therefore **not** on serving students who can **never** come to one of the District's campuses, but rather, on providing scheduling choices and flexibility to existing students and enabling opportunities to those who cannot regularly attend classes.

In light of the current role for distance education, the existing SCCCD supporting infrastructure is fairly appropriate. The Colleague WebAdvisor application fulfills many of the student support requirements, the advising and counseling services are available online and via telephone, the library can provide remote access to electronic resources via EZProxy, Blackboard provides robust asynchronous services and CCC Confer enables robust synchronous activities.

The SCCCD distance education infrastructure could be improved by:

- Adding professional instructional designer resources
- Providing additional instructional technology support for Blackboard, Camtasia, and CCC Confer web conferencing
- Providing richer technical training and support for both faculty and students,
- Providing more robust faculty support services
- Providing administrative support and leadership through a Dean or Director of Distance Education
- Expanding the Blackboard Community System as an academic portal to embrace more student groups, student services, and advisor/counselor organizations

Many members of the Distance Education Committees at the colleges expressed the desire to see the target for the District's online offerings embrace all potential students, regardless of location. Such an expansion of distance education mission would necessitate an associated expansion of the distance education support infrastructure. For example, many pure online programs specify that each online course should require at least one assessment that is administered under supervised conditions, such as providing a photo ID at a monitored testing facility. Technological solutions, such as Secure Remote Procter, have also evolved to help ensure that the student receiving course credit is the same student who completed required course assessments.

Instructional-Technology-Related Strategic Initiatives

This section proposes a set of instructional-technology-related strategic IT initiatives to guide decision making during the five-year planning period. These initiatives, and others that may be proposed, will need to be prioritized by importance, impact, and prerequisite relationship with all other proposed initiatives.

Strategic Initiative	**Instructional-1: Develop Classroom Design Standards** *Charge a cross-functional team of staff and faculty to create a classroom-design standards document to guide decision making in this area.*

Currently, SCCCD classroom design is not consistent (both among and within its individual campuses) in terms of layout, components, equipment, function, and performance. The District needs to create a classroom design standard to codify the desired classroom features and delineate and explain the guidelines for designing and updating classroom space at SCCCD. Ultimately, every instructor should be able to walk into any SCCCD classroom and feel confident that it will be equipped with a reliable, consistent user interface and set of instructional technologies.

Specifically, the District should implement a principle-based design approach to guide the evolution of classroom space throughout the District in a systematic and responsive manner. This approach seeks to base classroom design and renovation decisions on a set of established and accepted design principles. In this context, principles are rules or guidelines that elucidate components of the teaching/learning process. Such principles should be communally adopted based on collaboration among faculty, staff, and administrators with input from students. Once the set of agreed-upon principles have been clearly articulated, they can be used to create a strategic context in which to drive tactical decisions about specific technology alternatives. The principles have a significantly longer useful life expectancy than the specific technologies employed to implement them. This enables a consistency in classroom design efforts over time, while simultaneously adapting to new and emerging technology options.

Strategic Initiative	**Instructional-2. Implement a Classroom-Management Process** *Create and charge a "Classroom Management Team" to evaluate classroom space, manage classroom renovations and upgrades, maintain classroom-design standards, and manage a recurring budget to address classroom needs.*

The process of classroom renovation and technology updates should be managed by a dedicated team responsible to the Vice Chancellor Educational Services and Institutional Effectiveness, as "owner" of all District classroom space. All recommendations of the team for nonroutine activities (selection of classrooms to renovate, etc.) must be approved by the Vice Chancellor and relevant college president. This "Classroom Management Team" (CMT) should be responsible for:

- Articulating, monitoring, and maintaining a classroom design standards document. The classroom design standards should be the result of collaboration among SCCCD faculty, technical staff, instructional support staff, facilities staff, and others.
- Monitoring the condition and performance of SCCCD's classroom and learning spaces.
- Managing a recurring budget allocation to address classroom renovations and technology upgrades.

- Monitoring the progress of classroom renovations, including adhering to the committed time table and budget, reviewing completed work and generating project punch lists, and assessing the effectiveness of renovation efforts.
- Recommending major classroom renovations to the Vice Chancellor Educational Services and Institutional Effectiveness for approval before design.

The membership of the classroom management team should include selected representatives from IT (network, A/V, and instructional technologists), Maintenance and Operations, classroom scheduling, and faculty. No changes to SCCCD classrooms should ever occur without the knowledge and explicit approval of the CMT, acting as representatives of the Vice Chancellor.

Strategic Initiative	**Instructional-3: Explore Learning Analytics** *Explore the viability of implementing the Blackboard ASTRO building block as a low-cost introduction to learning analytics.*

For several years in a row, the Horizon Report, a joint project of the New Media Center Consortium and the EDUCAUSE Learning Initiative, has consistently identified learning analytics as one of six technologies annually predicted to have a great impact on higher education in the near-term horizon. Learning analytics seeks to apply data science to education to improve student retention and provide high-quality learning experiences.

A growing range of analytics tools are becoming available. For institutions using Blackboard, the ASTRO building block, developed jointly by Grand Rapids Community College and Seneca College under a grant from Blackboard, offers a free tool to allow the institution to harvest the wealth of usage data generated by the Blackboard web servers.

Strategic Initiative	**Instructional-4: Acquire Instructional-Designer Expertise** *Investigate the creation and staffing of a professional instructional designer position to assist with curricular and course design for online, hybrid, and traditional course development.*

Distance education is that situation in which the teacher and learner are not present in the same physical location and/or time. This basic fact implies that instructional sequences and materials must be developed in advance, as they cannot effectively be created remotely in an ad hoc manner. This development, in turn, implies the need for a course design and development process.

Because the design of online and hybrid courses is substantially different than the design of traditional face-to-face courses, faculty who may be expert in creating and delivering the latter may be challenged by the former. The online course design and development processes can be best facilitated and informed by instructional design expertise. An instructional designer is a

professional trained in learning and instructional theory and practice, and expert in the process of course development.

The instructional designer typically serves a wide range of instructional and faculty development needs. Some faculty merely require information about particular teaching methodologies, such as collaborative or active learning. Others need assistance with the development or revision of course materials, such as exams, PowerPoint presentations, or syllabi, or with addressing problem areas in their student course evaluations. Still others need more extensive assistance with the redesign of a course, the development of an instructional program, integration of new technology, or the design of web-based or self-instructional course materials.

Strategic Initiative	**Instructional-5: Feed Grades from Blackboard to Colleague** *Analyze and modify the existing Blackboard–Colleague integration process to include the submission of grades from Blackboard to Colleague.*

Grading at SCCCD is currently accomplished in a number of different ways:

- Some faculty reported using manual grade books and manually inputting grades to Colleague at the end of the term.
- Many faculty reported using MicroGrade to calculate and share grades with students before they put them into Colleague. Some faculty reported that they have partially automated the process of inputting grades by submitting an output file from MicroGrade into Colleague. To communicate their grades to students, faculty have either:
- Used the MicroGrade WebGrade (externally-hosted website) to share grades,
- Manually entered their grades into Blackboard so students can view them, or
- Posted a paper MicroGrade report in the classroom. Although these reports do not contain the student name, they do show the student ID number and are sorted in alphabetical order by student last name. Given that student ID numbers are not strictly confidential (they are visible in the student's email and Blackboard usernames), this practice may represent a serious privacy concern.
- Some faculty either manually input their grades into Blackboard or automate their grading process using the Blackboard Grade Center. Faculty then manually input their grades into Colleague. In either of these cases, students can see their grades instantly without having to wait for them to be available via WebAdvisor.

None of the currently-employed options for managing grades is particularly desirable. Fortunately, the Blackboard–Colleague integration process can be configured to allow grades to be posted into Colleague directly from Blackboard, thereby eliminating the need for a separate grading system and for duplicate data entry.

Strategic Initiative	**Instructional-6: Implement Blackboard Mobile Learn** *License and promote the Blackboard Mobile Learn application.*

The free (client-side) Blackboard Mobile Learn application for iPhones/iPods, iPads, Android, and Blackberry devices allows students and faculty to view and interact with their Blackboard course sections in a format and style suitable to their mobile devices. Student functionality is fairly complete, enabling content viewing, quiz taking, and participation in discussion boards. Instructor administrative functionality is limited to posting documents and announcements, and participating in discussion boards.

The free version of Blackboard Mobile Learn on the server side restricts access to Blackboard to access via Wi-Fi connections, rejecting connections via mobile data plans. To enable access via mobile data plans, the institution must pay an annual license fee to Blackboard.

Strategic Initiative	**Instructional-7: Provide Persistent File Storage for Students** *Explore institutional options for providing every active student with persistent file storage; investigate the feasibility of providing this storage through the integrated Blackboard Content System (separate license).*

Student focus groups identified the need for persistent online file storage accessible from campus, home, or work. Many faculty members also related the need to reach their mapped network drives from home.

Possible solutions to this need include cloud-based storage systems such as Google Drive, Microsoft OneDrive (formerly SkyDrive), Box, iCloud, etc. Blackboard also provides an intriguing Content System solution, based on Xythos technology. The Blackboard Content System provides a searchable hierarchical document storage system that integrates with the course and community systems. It provides drag-and-drop functionality from the desktop and allows file/directory sharing among individual users and via institutionally-defined roles. The Blackboard Content System also includes electronic portfolio functionality.

Strategic Initiative	**Instructional-8: Investigate New Instructional Technologies** *Investigate systemic implementations of new and emerging instructional technologies.*

SCCCD needs to initiate a formal procedure to investigate new and emerging instructional technologies with a goal of assessing which technologies hold promise for integrating well within the SCCCD instructional technology infrastructure. The new and emerging technology solutions should be investigated as formal collaborative projects involving faculty and support staffs from IT. Each pilot project will have an approved project plan, including clearly stated project deliverables, budget, timeline, responsibilities, and procedures to assess its success. Potential pilots could include, for example:

- Mobile Podium: Create one or more demonstration classrooms with a tethered, mobile, height-adjustable podium containing a SMART Podium and using a projectable whiteboard.
- Thin Client Instructor Computer: Create one or more demonstration classrooms that use a thin-client computer for the instructor's PC mounted in a tethered mobile podium with a SMART Podium. A critical component of this pilot is to also license each participating instructor with the VDI client application so they can access their "virtual classroom desktop" from their office, home, or mobile device.

Collaborative Work Lab: Create a demonstration classroom equipped with multiple data/video display systems capable of being controlled by small break- out groups of students in support of problem-based collaborative learning experiences. The solution should have the ability to smoothly re-integrate the small group work into the full classroom session. New systems are emerging that support collaborative work between and among students. For example, Google Docs supports document sharing and allows multiple users to simultaneously edit documents (with record-level locking).

IT STRATEGIC INITIATIVES

Every institution of higher education has IT needs beyond their available resources, requiring detailed planning and prioritization of IT initiatives and careful stewardship of IT resources. This section delineates important IT initiatives for the District and projects when they might be addressed during the five-year planning cycle. The annual tactical/operational plans will contain details of effort, costs, benefits, and schedules for their implementation.

The tables that follow summarize the proposed strategic IT initiatives for consideration during the five- year planning period. These initiatives and others that may be proposed will need to be prioritized by importance, impact, and prerequisite relationship with all other proposed initiatives. In the tables that follow, the shaded cells indicate the target fiscal year for implementation, pending revisions based on changing priorities and budgets. Each fiscal year (FY) column is the one ending on June 30 of that year.

Table 6—Network Infrastructure Strategic Initiatives		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Network-1	Perform a detailed District-wide network performance assessment and recommend improvements.					
Network-2	Develop and implement a District-wide network security plan encompassing all Colleges and Centers.					
Network-3	Extend wireless network coverage to all classroom and nonclassroom learning and work spaces.					

Table 7—Hardware Platform Infrastructure Strategic Initiatives		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Hardware-1	Complete a system inventory and associated life cycle replacement plan and budget.					
Hardware-2	Develop a formal process for assessing and acquiring hardware throughout the District.					

Table 8—Data and Document Infrastructure Strategic Initiatives		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Data-1	Complete the existing project to convert from UniData to MS SQL Server as the operational database for Ellucian applications.					
Data-2	Investigate and implement a data warehouse to support longitudinal and ad hoc reporting.					
Data-3	Investigate, analyze, and develop a document management solution to serve students, faculty, and staff.					
Data-4	Investigate, analyze, acquire, and deploy a user-friendly ad hoc reporting tool for the SQL Server environment.					

Table 9—Systems and Application Software Infrastructure Strategic Initiatives		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Software-1	Select and implement an identity-management system.					
Software-2	Revise business processes and maximize the Colleague administrative system.					
Software-3	Complete a system inventory of all software licenses, terms, and conditions and the associated life cycle replacement plan and budget.					
Software-4	Develop and implement a formal process for assessing, acquiring, and tracking software throughout the District.					
Software-5	Select and implement an electronic Student Education Plan.					

Table 10—Organizational Structure Strategic Initiatives		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Organizational-1	Create and fill a cabinet-level position of District Vice Chancellor for Information Technology (Chief Information Officer).					
Organizational-2	Create and fill a Chief Security Information Officer with District-wide security responsibilities for data, networks, and personal information.					
Organizational-3	Consolidate IT staffs.					
Organizational-4	Articulate an institutional information systems philosophy and set of guiding IT principles.					
Organizational-5	Develop and implement a one-year tactical/operational IT plan for FY 2015, aligned with the strategic IT plan.					
Organizational-6	Develop and implement a best-practice technology-support model for all technology support.					
Organizational-7	Institute a project-management methodology and function.					

Table 11—Organizational Structure Strategic Initiatives		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Organizational-8	Develop, implement, and test business-continuity and disaster-recovery plans.					
Organizational-9	Develop, implement, and test data and information security plans.					
Organizational-10	Review and improve the institution's PCI and PII compliance.					
Organizational-11	Improve the design and consistency of the District's and Colleges' web presences.					
Organizational-12	Analyze and improve the usability and functionality of online services to all District constituents.					
Organizational-13	Implement a District portal.					
Organizational-14	Consolidate the District's IT help services.					
Organizational-15	Analyze and improve the District's work processes.					
Organizational-16	Institute a technology-related professional-development program.					
Organizational-17	Expand student access to networked computers.					

Table 12—Instructional Infrastructure Strategic Initiatives		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Instructional-1	Charge a cross-functional team of staff and faculty to create a classroom-design standards document to guide decision making in this area.					
Instructional-2	Create and charge a "Classroom Management Team" to evaluate classroom space, manage classroom renovations and upgrades, maintain classroom-design standards, and manage a recurring budget to address classroom needs.					
Instructional-3	Explore the viability of implementing the Blackboard ASTRO building block as a low-cost introduction to learning analytics.					
Instructional-4	Investigate the creation and staffing of a professional instructional designer position to assist with curricular and course design for online, hybrid, and traditional course development.					
Instructional-5	Analyze and modify the existing Blackboard–Colleague integration process to include the submission of grades from Blackboard to Colleague.					
Instructional-6	License and promote the Blackboard Mobile Learn application.					
Instructional-7	Explore institutional options for providing every active student with persistent file storage; investigate the feasibility of providing this storage through the integrated Blackboard Content System (separate license) or through Office 365.					
Instructional-8	Investigate systemic implementations of new and emerging instructional technologies.					

INSTITUTIONAL AND IT ALIGNMENT

The strategic information technology plan must align closely with the institutional strategic vision, mission, and goals and should drive similarly-aligned annual tactical/operational plans.

In 2012, the District collaborated across its full range to constituents to articulate *The Student Experience at State Center*, defining the ideal student experience:

Our students…

Learn in a rigorous and engaging environment that cultivates deductive reasoning skills and creative thinking.

Respect independence and value the support and guidance that is available at State Center.

Take responsibility for their futures.

Value education and seek ways to overcome obstacles.

As faculty, staff and administrators we commit to...

Serve the unique needs of our students so they achieve their personal and professional goals.

Model behaviors we want our students to emulate.

Inspire our students to follow a path to personal and professional development.

Prepare our students for transfer and career opportunities.

This statement helps drive the institutional and IT visions and missions.

Vision Alignment

District Vision	District IT Vision
State Center Community College District will demonstrate exemplary educational leadership to foster and cultivate a skilled workforce and an educated citizenry that is well prepared professionally and personally to contribute to our community.	By December 2017, provide seamless integration of technology throughout an environment that promotes student access and learning that prepares the District's students to be innovators and leaders in the global workforce.

Mission Alignment

District Mission	District IT Mission
State Center Community College District is committed to student learning and student success, while providing accessible, high quality, innovative educational programs and student support services to our diverse community by offering associate degrees, university transfer courses and career technical programs that meet the academic and workforce needs of the San Joaquin Valley and cultivate an educationally prepared citizenry.	State Center Community College District is committed to providing a reliable technological environment that promotes a student-centered learning environment while meeting the needs of students, faculty, staff and administration by providing a high level of access to readily available, relevant information.

Strategic Initiatives Alignment to District Strategic Goals

Table 13—Strategic Initiatives Alignment to District Strategic Goals

District Strategic Goal	Related Strategic IT Initiatives
Goal 1: Student Success	Data-2: Acquire and Implement a Data Warehouse Data-3: Acquire and Implement a Document Management Solution Data-4: Implement a User-Friendly Ad Hoc Reporting System Software-5: Implement an Electronic Student Education Plan Organizational-12: Improve Online Service Delivery Organizational-13: Implement a District Portal Instructional-3: Explore Learning Analytics Instructional-4: Acquire Instructional Designer Expertise Instructional 5: Feed Grades from Blackboard to Colleague Instructional-6: Implement Blackboard Mobile Learn Instructional-7: Provide Persistent File Storage for Students
Goal 2: Student Access	Data-3: Acquire and Implement a Document Management Solution Software-5: Implement an Electronic Student Education Plan Organizational-11: Improve Web Presence Organizational-12: Improve Online Service Delivery Organizational-13: Implement a District Portal Organizational-17: Expand Student Access to Networked Computers

Table 13—Strategic Initiatives Alignment to District Strategic Goals	
District Strategic Goal	**Related Strategic IT Initiatives**
Goal 3: Teaching and Learning Effectiveness	Network-1: Perform a District-Wide Network Assessment Network-3: Implement Ubiquitous Wireless Access Data-4: Implement a User-Friendly Ad Hoc Reporting System Organizational-1: Hire a Chief Information Officer Organizational-12: Improve Online Service Delivery Organizational-13: Implement a District Portal Organizational-16: Institute Technology-Related Professional Development Instructional-1: Complete a Learning Space Inventory Instructional-2: Develop Classroom Design Standards Instructional-3: Implement a Classroom Management Process Instructional-3: Explore Learning Analytics Instructional-4: Acquire Instructional Designer Expertise Instructional-5: Feed Grades from Blackboard to Colleague Instructional-6: Implement Blackboard Mobile Learn Instructional-8: Investigate New and Emerging Instructional Technologies
Goal 4: Economic and Workforce Development	Organizational-12: Improve Web Presence Organizational-13: Improve Online Services
Goal 5: Communication	Software-1: Implement Identity Management Software-2: Maximize Ellucian Colleague Organizational-1: Hire a Chief Information Officer Organizational-4: Articulate Information Systems Principles Organizational-6: Develop a Best-Practice Support Model Organizational-7: Institute a Project Management Function Organizational-8: Reassess and Revise Business Continuity Plans Organizational-11: Improve Web Presence Organizational-12: Improve Online Service Delivery Organizational-13: Implement a District Portal Instructional-2: Develop Classroom Design Standards Instructional-3: Implement a Classroom Management Process Instructional-6: Implement Blackboard Mobile Learn

Table 13—Strategic Initiatives Alignment to District Strategic Goals	
District Strategic Goal	**Related Strategic IT Initiatives**
Goal 6: Organizational Effectiveness	Data-1: Complete Conversion to SQL Server Data-2: Acquire and Implement a Data Warehouse Data-4: Implement a User-Friendly Ad Hoc Reporting System Software-1: Implement Identity Management Software-2: Maximize Ellucian Colleague Organizational-1: Hire a Chief Information Officer Organizational-2: Hire a Chief Information Security Officer Organizational-3: Consolidate IT Staffs Organizational-4: Articulate Information Systems Principles Organizational-5: Develop a District Operational IT Plan Organizational-6: Develop a Best-Practice Support Model Organizational-7: Institute a Project Management Function Organizational-9: Create Information Security Plans Organizational-10: Improve Institutional Compliance Organizational-14: Consolidate the District's IT Help Services Organizational-15: Analyze and Improve Work Processes Organizational-16: Institute Technology-Related Professional Development Instructional-3: Explore Learning Analytics Instructional-4: Acquire Instructional Designer Expertise Instructional-5: Feed Grades from Blackboard to Colleague

SUMMARY AND NEXT STEPS

This strategic IT plan, created in collaboration with faculty, staff, administrators, students, and consultants, is intended to chart the direction for the development and evolution of information technology infrastructure, services, and support at SCCCD. The plan was not intended to dictate specific operational solutions, but rather, to provide a strategic context within which operational IT decisions can be made about information systems issues, acquisitions, implementations, and ongoing support.

This initial strategic information technology plan should not be viewed as an end to IT planning but rather as a beginning. It should immediately generate a one-year tactical/operation plan to guide IT acquisitions and decisions for fiscal year 2015. The experiences gained during the implementation of that one-year operational plan will provide feedback to further inform and shape the long-term strategic plan. The strategic plan can therefore be "tweaked" annually and revisited in detail every five years.

After this plan has been thoroughly vetted with the District community and approved through

governance, the next steps are to operationalize its initiatives:

1. Review, revise, and gain consensus on an institutional information systems philosophy and set of guiding IT principles; revise the strategic IT plan as needed.
2. Review the strategic IT initiatives, determine priorities, and propose FY 2015 tactical initiatives.
3. Estimate the costs and benefits, both tangible and intangible, of each of the proposed FY 2015 tactical initiatives. As you do so, keep in mind the importance and immediacy of strategic initiative Organizational-1: Hire a District Chief Information Officer. Without someone full-time on the Cabinet in this essential position, many of the plan's most important initiatives will be exceptionally more difficult to achieve.
4. Determine the feasibility of each of the proposed FY 2015 tactical initiatives from an operational, technical, economic, and organizational perspective.
5. Set priorities among the selected feasible FY 2015 tactical initiatives.
6. Create detailed project plans and schedules for the prioritized FY 2015 tactical initiatives.
7. Set project milestones and completion dates for the prioritized FY 2015 tactical initiatives.
8. Create the FY 2015 Tactical/Operational Plan; revise the strategic IT plan as needed.
9. Monitor the completion of FY 2015 tactical initiatives and tactical plan performance; revise the strategic IT plan as necessary.

The IT strategic plan is intended to be a "living document," responsive to the needs and aspirations of its constituents. All members of the SCCCD community are invited to participate in its creation and ongoing refinement and maintenance.

APPENDIX A: ACKNOWLEDGEMENTS

The following standing committees and groups participated in the creation of this plan:

Chancellor's Cabinet
Communications Council
District Office North Staff
District Strategic Planning Committee
District Technology Advisory Committee
Fresno City College Academic Senate
Fresno City College Associated Student Government
Fresno City College Classified Professionals
Fresno City College Distance Education Committee
Fresno City College Faculty
Fresno City College Instructional Technology Committee
Fresno City College Management Council
Fresno City College President's Advisory Council
Fresno City College Strategic Planning Council
Fresno City College Technology Advisory Committee
Madera/Oakhurst Centers Faculty
Madera/Oakhurst Centers Staff
Madera/Oakhurst Centers Student Forum
Reedley College Associated Student Government
Reedley College Distance Education Committee
Reedley College President's Advisory Cabinet
Reedley College Staff
Reedley College Student Success Committee
Reedley College Technology Advisory Committee
Willow International Center Cabinet
Willow International Center Distance Education Committee
Willow International Center Faculty
Willow International Center Staff
Willow International Center Technology Advisory Committee

The following individuals contributed to this plan through their meeting and forum participation and by provisioning valuable input and feedback:

Nina Acosta, Executive Secretary to the Chancellor
Melissa Affeldt, DSPS
Norma Aguilar, Financial Aid Assistant II Fresno City College
Shannon Aguilar, Learning Resource Center
Shannon Ahrens, Accounting Supervisor
Karen Ainsworth, Admissions and Records
LuAnn Aldape, DSPS
Carmen Alessandro, District Admissions
Mary Alfieris, Coordinator Veterans and International

Becky Allen, Physical Education/Health
Azim Ali, Willow ASG leadership student
Bill Allen, Mathematics
Leticia Alvarez, Manager Reedley College
Franchesca Amezola, Foreign Languages
Tiffany Andrade, MSE/Instructor
Alyssa Anrig, Willow ASG leadership student
Pedro Avila, Dean of Admissions
Brian Baker, CIT/ITC
Donna Baker-Geidner, MCRT Reedley
David Balogh, Physics Instructor Fresno City College
Janet Barbeiro, Secretary, Vice Chancellor Educational Services and Institutional Effectiveness
Stephen Barilli, Madera Center Faculty
Kelly Barkley, District Admissions
Autumn Bell, Distance Education Committee Chair Fresno City College
John Bengtson, Director of Information Systems
Donna Berry, Vice President, Administrative Services
Valerie Binion, Historian Student Senate Willow International College Center
Jothany Blackwood, Dean of Instruction
Deborah G. Blue, Chancellor
Kathy Bonilla, Public Information Officer
David Borofka, Distance Education Coordinator Reedley College
Kyle Borzoni, ASG Delegate
Michael Bourbonnais, Micro Computer Specialist
Colleen Brannon, Counselor
Juan Bravo, Building Services Manager
Cris Monahan Bremer, Marketing Director
Eleanor Bruce, Accounting Clerk III
Jeff Burdick, Academic Senate President Willow International College Center
Wesley Burmer, Reedley College student
Marie Byrd-Harns, Dean
Rosemarie Caban, Reedley College student
Carlos Calderon, Computer Operator, Information Technology Support
Jesse Calderon, MCRT Reedley
Sandra Caldwell, President, Reedley College and Madera and Oakhurst Centers
Ashley Calhoun, DSP&S Counselor Reedley College
Candy Cannon, Financial Aid Manager, Willow International College Center
Tony Cantu, President, Fresno City College
Jose Castillo, Student Senator Willow International College Center
Rene Castro, Reedley College student
Anthony Celaya, Micro Computer Resource Technician
Donna Chandler, Library
Brandon Chavez, Willow ASG leadership student
Henry Chen, Programmer/Analyst
James Chin, Dean of Instruction Madera Center
Janine Christl, Theatre Arts
Rick Christl, Dean Applied Technology

David Clark, Dean of CTE Reedley College
Joyce Clark, Department Secretary
Diane Clerou, Associate Vice Chancellor, Human Resources
Nathaniel Clutter, Student Senator Willow International College Center
Linda Cooley
Abraham Corona, ASG Madera
Chris Cortes, Director Financial Aid Reedley College
Bill Costanas
Monica Cuevas, Dean of Students Fresno City College
Natalie Culver-Dockins, Dean of Workforce Development Fresno City College
Debra Curtis, Admissions
Stephanie Curry, Librarian Reedley College
Jared Dalley, President Student Senate Willow International College Center
Laurel Dand, Librarian
James Davis, Microcomputer Resource Technician Madera Center
Elizabeth Davitian, CSEA Fresno City College Vice President
Nick Deftereos, Mechanized Agriculture
Jan Dekker, Interim Vice President of Instruction Reedley College
Linda DeKruif, Academic Senate Past President
Paula Demanett, Librarian, Academic Senate Recording Secretary Fresno City College
Steve Dent, Art
Joseph Diebert, Occupational Health and Safety Officer
Lore Dobusch, Counseling Reedley College
Linda Dover, DSPS
Kimberly Duong, Account Clerk III, Willow International
Kathy Echols, Counseling
Sarah Edwards, Health Information Technology Fresno City College
Cole Egoran, Reedley College student
Garry C Elliott, Criminology
Karen Elliott, Admissions
Desiree Encinas, Classified Representative Fresno City College
Ed Eng, Vice Chancellor Finance and Administration
Robert Falcon, Reedley College student
Julie Falconer, CampusWorks
Lee Farley, Dean of Students Fresno City College
Sarah Fisher, Willow ASG leadership student
John Fitzer, Interim Vice President for Madera and Oakhurst Centers
Kelly Fowler, Vice President Instruction and Student Services Willow International College Center
Nancy Frampton
Charles Francis, Director of Training Institute
Erik Fritz, English
Sandra Fuentes, Director of Student Support Services
Robert Gafford, Microcomputer Resource Technician
Ernie Garcia, Department Secretary to Vice President Student Services
Rick Garza, English
Randy Genera, Reedley College

Emilie Gerety, Secretary to the President Reedley College
Chris Glaves, Engineering, Mathematics, Physics
Cecilia Godinez, Willow ASG leadership student
Francisco Gomez, ASG
Mario Gonzalez, Management Reedley College
Doris Griffin, Dean of Students Willow International College Center
Karin Gruet, Academic Senate Membership Secretary
Steve Grusis, Programmer/Analyst
Emily Haas, ASG
Claudia Habib, Interim Dean
Stephanie Harris, Department Chair Counseling Fresno City College
Richard Harrison, Print, Media and Communications Manager Fresno City College
Marc Haskell, Business and Technology
Diane Hatai, Accounting Technician II, Willow International
Christy Hedstrom, Buyer
Sean Henderson, Director of Student Activities Fresno City College
Teng Her, Network Coordinator Reedley
Tami Herman, Department Secretary
Bob Hill, Instructional Aide
Ryen Hirata, DSPS Counselor
Lorrie Hopper, Vice President of Administrative Services, Willow International College Center
Cherylyn Hornsby, Research Assistant
Phil Howard, Distance Education Support Technician
Deborah Ikeda, Campus President, Willow International College Center
Jeremy Inocencio, Register-to-Go Assistant
Susette Ishizuka, Accounting Technician II
Edward James, ASG President Fresno City College
Shannon Jefferies, Physical Education/Athletics Reedley College
Erica Johnson, Counseling
Jennifer Johnson, Dean of Humanities
Keith Johnson, Lead Programmer Analyst
Michelle Johnson, Institutional Research Coordinator
Martin Manriquez Jones, Student Senator Willow International College Center
Martine Jones, Willow ASG leadership student
Steven Jones, Counseling
Veronica Jury, Student Services Specialist
Linda Kane, Counselor: Learning Disabilities Specialist
Carey Karle, English Instructor Reedley College
Lynne Kemmer, Librarian
Kherstin Khan, Instructor Fresno City College
Robert Kim, Webmaster
James King, Willow ASG leadership student
Elina Korapetyon Student Senator Willow International College Center
Caroline Kubin, Programmer/Analyst
Patrick Lepore, CampusWorks
Nick Laudato, CampusWorks
John Leal, Trustee

Janice Legerwood, Reedley Faculty
Joe Libby, History
Richard Lindstrom, Director of Police Academy
Frances Lippmann, Admissions and Records Manager, Fresno City College
Linda Little, Secretary to the President Willow International College Center
Charlie Lochbaum, Network Coordinator
Jose Loera, Madera Center Student
Don Lopez, Director of Technology Fresno City College
Melissa Lopez, ASG
Nickolas Lucio, Social Sciences
Steve Maciel, Micro Computer Resource Technician
Cheryl Manning
David Manyvanh, ASG Treasurer
Ruby Marin-Duran, Counselor Reedley
Nereyda Maroot, Humanities Faculty Fresno City College
Sheila Martin, Business and Technology Instructor Fresno City College
Anna Martinez, Communications Instructor Reedley College
Frank Martinez, Reedley College student
Kristen Mattox, Physical Education
Lisa McAndrews, Residence Hall Supervisor
Keelin McCabe, Administrative Assistant to Vice President Student Services
Cynthia McDonald, Librarian, Willow International Center
Todd McLeod, Computer Information Technology
Daniel Mekhoc, ASG Senator
Linda Mendez, Counselor
Yolanda Mendoza, Accounting Technician I
Margaret Mericle, Dean of Instruction
Tom Mester, Dean of Instruction Willow International College Center
Christine Miktarian, Manager Construction Services
Bruce A Miller, Electrical Systems Technology
Dolly Mizner, Student Senator Willow International College Center
Aaron Morgan, Student Senator Willow International College Center
Jeannie Morgan, Accounting Technician for CalWorks/CalProNet
Victoria Mosby, ASG
Dede Mousseau, English, French
Jim Mulligan, Student Activities
Liz Murphy, CampusWorks
Brent Nabors, Information Systems Faculty Willow International College Center
Ash Naimpally, Dean Math, Science and Engineering Fresno City College
David Navarro, College Relations Specialist
Jerry Neff, Programmer Analyst
Phil Nelson, Senior Systems and Network Analyst
Linda Nies, Accounting Supervisor Reedley College
David Nippoldt, Instructor Reedley College
Ron Nishinaka, Trustee
Susi Nitzel, Classified Senate/Administrative Services
Frank Nunoz, Center for International Trade Development

Maria Ortiz, Reedley Faculty
Cathy Ostos, Administrative Assistant
Bill Ouchark, CampusWorks
Mariam Pambukyan, Willow ASG leadership student
John-Robert Parker, Willow ASG leadership student
Teresa Patterson, Executive Director for Public and Legislative Relations
Anna Perez, ASG Senator
Sergio Perez, Student Senator Willow International College Center
Vikki Piper, Oakhurst Campus Coordinator
Craig Polanowski, Graphic Communications
Erlinda Ragasa, Accounting Technician
George Railey, Vice Chancellor Educational Services and Institutional Effectiveness
Blanca Ramirez, ASG Senator
Graciela Ramirez, Counselor
Linda Reither, Learning Disability Specialist
Marieangeline Rico, Willow ASG leadership student
Cynthia Rivera, Madera Student Body Secretary
Michael Rivera, Reedley College student
Michael Rodriguez, Counselor
Fred Rola, Microcomputer Specialist Reedley
Leanne Ruiz, Willow ASG leadership student
Lucy Ruiz, Public Information Officer
Gary Sakaguchi, Director of Technology Reedley College and North Centers
Jeannie Santos, Instructor Fresno City College
Richard Santos, Dean Business
Nathan Saari, Assistant Residence Hall Supervisor
Elba Scherer, Student Senator Willow International College Center
Diane Schoenburg, VP Academic Senate Willow International College Center
Ralph Schwehr, Database Administrator
Carol Shimer, Office Assistant II
Matt Shubin, ASG Senator
Gurdeep Sihota-He'bert, Executive Director, SCCC Foundation
Kathy Sims, Student Senator Willow International College Center
Leslie Silva, Counselor
Mason Silva, Willow ASG leadership student
Dottie Smith, Trustee
Lorraine Smith, Business and Technology
Rebecca Snyder, English Instructor Reedley College
Brian Speece, Associate Vice Chancellor for Business and Operations
Martin Spurrier, Telecommunication Systems
Wendell Stephenson, Academic Senate President-Elect
Michelle Stricker, Matriculation Coordinator Reedley College
Desiree Stumpf, Willow ASG leadership student
Patrick Stumpf, Student Activities
Danny Sullins, Vice President Student Senate Willow International College Center
Cheryl Sullivan, Vice President Administrative Services
Frances Tabanas, Student Senator Willow International College Center

Gregory Taylor, General Counsel
Julie Thurber, Instructor Reedley College
Laurie Tidyman-Jones, Counselor Reedley
Kira Tippins, Director of Financial Aid Fresno City College
Juan Tirado, Accounting Clerk III
Ray Tjahjadi, Information Systems
Enrique Torres, Microcomputer Specialist Reedley
Robin Torres, District Research Coordinator
Samara Trimble, DSP&S Reedley College
Nick Turner, Reedley College student
Sally Turpen, Child Development
Christina Valencia, Articulation Officer
Mary Ann Valentino, Psychology, Academic Senate President Fresno City College
Collin Van Loon, VP Finance Student Senate Willow International College Center
Choua Vang, Office Assistant II
Gao Vang, ASG Senator
Pa Vang, ASG Senator
Chris Villa, Vice President Student Services Fresno City College
Tabitha Villalba, Writing Center
Melinda Vinicor, CHSS Instructor
Randall Vogt, Director of Purchasing
Barbara Wells, Financial Aid Assistant I, Willow International
Brianna White, Student Senator Willow International College Center
Michael White, Vice President of Student Services Reedley College
Rhonda Williams, Athletic Director
Robert Williams, Madera Center English Tutor
Jon Wilson, Fresno City College
Tim Woods, Vice President of Instruction
Michael van Wyhe, Reedley Chair of Department of Reading and Languages
Mary Beth Wynn, Bookstore Manager
Mai Yang, Librarian
Kerry Ybarra, Academic Senate Curriculum Chair
Harold Zahlis, Network Coordinator Fresno City
Lijuan Zhai, Director of Institutional Research

APPENDIX B: ILLUSTRATIVE SCENARIOS

This appendix provides a series of scenarios, in story form, that illustrate how the information systems architecture might impact work at SCCCD. These concrete illustrations show how the proposed information architecture will function and what it can do for individuals within the institution when fully implemented. They are intended to show some of the functional capabilities of the information systems architecture as well as the relationships among various components.

Envisioned System from Student Perspective

Roberta is a full-time student in the Communications program at Reedley College. Today, Roberta intentionally arrives at campus a few hours early to meet with some fellow students and work on their group project.

Because she has time to spare before meeting with the group, she borrows a Library laptop and signs into the SCCCD portal. She likes working at the Library because of the fast network access (something she does not have from home), the comfortable environment, the handy power outlets, and the helpful librarians.

Roberta notices that the portal shows she has three new email messages. With one click, she accesses her messages and finds that two of them are from students and the third is from the Registrar. Roberta decides to read the student messages immediately. One is from a student she is tutoring, containing a desperate plea for help with the concepts that were taught in his last class. Roberta decides that the best course of action is to set up an individual session with him in the tutoring center as soon as possible. She accesses the calendaring system and asks for the first free hour they have in common, and then sends a meeting request.

The second message is from a friend who is enrolled in a course she is taking. This student is attempting to complete Assignment 3, due next week, and is asking for help understanding the requirements of the assignment. The question is straightforward and Roberta creates a response immediately, linking to the assignment grading rubric in Blackboard, and adding a few explanatory notes.

The third message is from the Registrar, informing Roberta that the department offering one of her classes for next term has just canceled the course. The message outlines her options. Roberta has several weeks to decide what to do, but she chooses to resolve it immediately. She follows the link in the message to access the online schedule of classes, and finds that she has two choices for the same course: one offered at the Madera Campus and another offered as a hybrid course at the Fresno City College. She dislikes driving, but with half as many meetings, at times that fit her schedule, the hybrid class just might work. She reads about the hybrid course experience, takes the distance education readiness assessment, and feels comfortable she can handle it.

She visits the Blackboard course section for this term (faculty routinely allow “guests” to see common course components such as the syllabus, orientation, and instructor information), likes what she sees, and with another click is registered. The registration is tentative because it will

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211

TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

require her counselor to electronically "sign off" on it, but her spot is reserved.

Her calendar reminder tells her it is time to meet with her group. They've reserved a small study room where they all convene and plug their laptops into the switching device that lets them share access to the large-screen flat display panel at the end of the table. Each student in the group presents their ideas and research by sharing them on the large screen. Roberta takes the lead in creating the structure of the shared wiki page that will serve as their report within their group area in Blackboard, and all begin to simultaneously outline their parts of the wiki group project.

They agree to correct each other's contributions and to post comments in the wiki throughout the next week, and then touch base to review the wiki as a group. They request the room reservation for next week and receive a confirmation.

Since she still has some time before her next class, Roberta pulls up the Blackboard site for another course, meeting later in the week. This instructor has "flipped" this course and has asked each student to review his captured lecture in advance of the class meeting so they have the appropriate background for discussion. The link from the Blackboard site to the recorded lecture lets Roberta download the presentation to her flash drive, enjoying the benefits of her high speed wireless connection at the Library, so she can easily watch it later from home (where it would have taken forever to download). The download completes quickly, she unplugs the laptop and returns it, then proceeds to her class. As she is still early, she takes 10 minutes to complete a quiz in Blackboard using the mobile app on her smart phone.

Her instructor has a surprise for the class. They're meeting today in a computer lab, and there will be a guest lecturer, an old college friend who is a noted art historian at Pratt Institute. The instructor introduces Dr. Angelo, who is going to speak to the class from his home in New York City, via Web conferencing. Dr. Angelo shows up online and asks the students to follow him to a virtual museum in France, where he begins talking about impressionism and showing many examples.

Roberta watches as Dr. Angelo drags two images into the shared whiteboard and talks about the particular colors that the artists used. He goes to a page that has a picture of a color wheel and talks about why the particular colors that were chosen work so well. He asks students to go off and find some good examples of artwork with similar color schemes, and gives them a list of a half-dozen links to sites at which they can start searching. After about ten minutes the students regroup, and each one copies their offering onto the shared whiteboard. Dr. Angelo talks about how each picture uses colors to achieve different effects and pastes some of his favorite quotes from artists regarding color onto the page. When class is over, Roberta copies a link to the lesson transcript to her smartphone so she can review it again later. Good class!

Envisioned System from Instructor Perspective

After arriving at his office, Luis logs into the SCCCD portal and sees that he has several electronic messages and an alarm on his calendar. He clicks on the alarm signal, which informs him that he has a student, Sarah, coming for a counseling session in an hour. Luis quickly accesses Sarah's electronic Student Education Plan (SEP), reviews his notes from previous meetings (as well as those of Sarah's

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211

TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

previous counselor), and checks Blackboard for any course-related alerts about the student from the student retention add-on package. Everything looks good, so he minimizes the windows and proceeds to other things.

Before Sarah arrives, Luis turns to the online course he is teaching and decides to publish the completed workbook for the latest module. This only takes a moment, so he then decides to continue working on an article he is writing until the student advisee arrives. He opens the document and begins reading what he wrote yesterday. He decides he needs a reference for a point he is trying to make, so he pops up the portal window and selects the library catalog browser. He enters his search query and the system displays a list of matching items. After narrowing his query, he finds a bibliographic citation that appears to fit his needs and follows the link to an electronic copy of the book. He also finds three electronic journal articles on the topic. He peruses these articles online and determines that one is worth reading. He imports this article into a file on his computer for later reading.

A knock at his office door signals that Sarah has arrived. She enters and is directed to a seat in the office. Sarah tells Luis she wants to register for a science course and a humanities course to complete her requirements. She also wants to take two math courses and a computer course.

Luis checks the courses against the student's SEP, agrees that they are good choices, and, since it is just as easy to enroll the student into the classes as it is to approve them, asks her if that is what she wants. In a few clicks, it is done, Luis updates Sarah's advising record with notes about the visit, and they chat for several minutes about the current term and some shared interests.

After Sarah leaves, Luis decides to look at the roster for the new class he was asked to teach in the next term in the place of his colleague who will be on sabbatical. Not sure whether he'll ever teach the course again, Luis had decided not to use the automatically-created Blackboard section. Nonetheless, it is the quickest way to access the required course information because every Blackboard section is prepopulated with all known course information extracted from Colleague.

He returns to the portal window, clicks the "Blackboard" link, and launches a new browser. Because the portal is integrated with Blackboard, there is no need to login, so he simply clicks on the course name on his Blackboard start page and accesses his new course. He checks the class roster and is presented with a list of students in his class. He thinks he recognizes the name of one of the students and clicks it. The system displays basic information about the selected student and, sure enough, the student is the sister of one of his best students from a few years ago.

Now it's time to get ready for the class he is teaching. Because the class that meets before his usually runs late, he wants to prepare so he can hit the ground running when he gets into the class. He calls up the virtual desktop interface (VDI) application on his desktop computer and accesses his virtual classroom desktop, which appears as a window on his computer. He launches PowerPoint with the presentation he wishes to make in class, opens an Excel spreadsheet with some charts he wants to reference, and launches a few web browsers to access some images and videos he wishes to show. When he gets to his classroom, now all he'll have to do is to login to the instructor's computer, a thin client, and his virtual classroom desktop will look exactly as he just configured it. Since the thin

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211

TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

client computer can boot in seconds, he will be ready to go without delay. Off to class!

Envisioned System from Staff Perspective

Ben, a member of the Financial Aid team for the last two years, has dealt with many parents, applicants, students, counselors, faculty, and staff in the performance of his duties. Today is no different. Ben begins each day by grabbing a cup of coffee while scanning The Fresno Bee online. Half a cup of coffee later, Ben checks his messages. He notices that he has three email messages and a voicemail message. His first email message is from Patricia from the Registrar's Office. Patricia and Ben have been working on a new student publication for the last several weeks. Patricia is sending Ben a link to the latest draft on the shared file server for his review. Patricia is also reminding him that the draft needs to be presented next week to an ad hoc working group for their review. Ben follows the link, turns on change tracking, edits the shared document, and replies to Patricia that she can review his changes and distribute the document.

The second message is from Melissa, a member of the Student Accounts Office. Late yesterday afternoon Melissa was working with a student who was planning to register next year for a special program. The student has a portfolio of scholarships and loans and had several questions regarding timing of registration and billing, payment and refund procedures, financial aid deadlines, and the availability of any special financial aid related to this special program.

Melissa encouraged the student to contact Ben because he is the financial aid coordinator for special programs. Ben clicks on an icon and accesses the student application. Ben clicks back to the messaging window and constructs a brief email message. The software knows the student's address and routes the message to the student.

The third message is from Tony, Ben's old boss from Maricopa Community College. Tony heard from his higher education contacts that State Center initiated some process analysis, process reengineering, and TQM projects several months ago, and he's looking for some indication of how things have been going. He is especially interested in finding out whether State Center has reengineered its enrollment management process because Maricopa is about to embark on a reengineering project as well. Ben responds with an explanation of their methodology and copies of a few of his process maps.

Ben then accesses the voice mail message. It is from a high school junior, Ed, who is trying to plan his course of studies for next year and is not sure which of several suggested courses will best prepare him for Clovis Community College. Ed leaves his name, address, and phone number with the message. Ben receives many calls similar to Ed's. Ben clicks on an icon in one of his windows and finds himself in the recruitment application for admissions. He uses the phonetic searching capabilities of the system and identifies that Ed has an existing recruitment record. Ben displays a log of all the contacts that SCCCD has had with Ed for the last six months. He decides to send Ed some literature with a letter inviting Ed to campus. Ben clicks on a word processing icon and easily constructs the letter using some boilerplate text available for correspondence such as this. Once the letter is completed, Ed's name and address is automatically placed on the letter and the recruitment system log updated immediately. The letter is printed, packaged, and on the way to the mailroom

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211
TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

within minutes. Ben now reviews his calendar and decides to try to call Ed late this afternoon. Personal contact is a high priority for Ben as well as quick turnaround to any inquiry related to admissions.

Ben realizes that it's time for a second cup of coffee. He chuckles to himself as he walks to the coffee machine thinking that two years ago it would be time for lunch given the amount of work he accomplished already.

Envisioned System from Administrative Perspective

The Dean needs to analyze the pros and cons of offering a new program at one of the centers and delegates the work to her assistant, Susan. Susan decides that the information needed is a profile of courses taught in a similar program, a profile of students who might attend at the site, a profile of available teachers, and a financial analysis of costs and revenues for comparable programs over the last five years. She accesses the District's Executive Information System software and is able to view a set of choices for types of information available.

She selects "courses" as her starting point and requests counts by department of all courses taught by site over the last five years. This list is brought into a separate window as a table. She now requests a count by degree program and students registered. This list is placed in a second window. She then indicates that the system should retrieve counts of faculty who taught these courses and the costs associated with reimbursing them. This is brought into a third window.

Susan decides that she wants to see a graph of these figures by year, and directs the system to import the frequencies into a graphing package for a quick review of trends. She drags the graphs into her word processor for use when producing her final report.

She requests tuition income for each class, faculty salary paid for teaching each class, and the difference between income and salary paid for each class, sorted by the difference. She continues to manipulate this data in many different ways and, from time to time, requests additional data such as the number of students in classes who are getting different types of financial aid or the number of teachers who are part time. To get this data for Susan, the system accesses the District's data directory and the student, human resources, and financial application databases. It also accesses the data warehouse that acts as a repository for all longitudinal data. This is accomplished by the desktop query and report software on her PC and the SQL database servers communicating over the SCCCD network in a manner that is completely transparent to Susan.

When Susan has performed all the analysis she desires, she uses these results, including graphical representations where appropriate, to produce a report about instruction that she forwards to the Dean as an attached document. The intermediate results of searching, sorting, and analyzing can be discarded, or selected results can be stored in files or a database on the local server for sharing with others, if needed. The Dean edits the report and sends it to a list of individuals who are asked to respond to the analyses. When she has received the feedback electronically, she incorporates what she wants and prepares a final recommendation for the President.

APPENDIX C: A PRIMER ON STRATEGIC AND TACTICAL INFORMATION TECHNOLOGY PLANNING

Strategic IT planning is intended to provide the "big picture" of information technology at an institution. That is, it provides a set of high-level guidelines for IT decision-making and tactical planning. Strategic plans typically look as much as five years ahead to lay the foundations for filling anticipated IT needs. The view is high-level, insufficient detail to deal with every nuance of the future yet enough detail to clarify intent.

In explaining the role of technology in business process reengineering, Massachusetts Institute of Technology researcher Michael Hammer called technology the "essential enabler" that allows us to perform work at levels of efficiency and effectiveness that would be otherwise impossible. Technology should not be the driver of change, dictating how we work, nor should it be an afterthought, automating our traditional manual processes. Rather, information technology must be incorporated as an integral collaborative partner in work decisions toward the goal of optimizing their efficiency and effectiveness. Consequently, strategic IT plans should align with institutional strategic plans.

A strategic IT plan should:

- Delineate the status of information technology at the inception of the planning period (where are we now?),
- Delineate the range of possible directions across the domain of information technology (where can we go?),
- Clarify the relationship between IT plans and institutional plans (why are we proposing these initiatives?),
- Select a path for the planning period (where do we want to go?), and,
- Outline the steps to achieve the planning goals (how will we get there?).

The three- to five-year strategic plan should align closely with the institutional strategic vision, mission, and goals and should drive similarly-aligned annual tactical/operational plans. These one-year tactical/operational plans contain the implementation details required to realize the goals of the strategic plan. They also inform and update the directions outlined in the strategic plan.

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211

TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

Figure C-1—Relationship of Tactical to Strategic Plans.

In addition to strategic and tactical IT plans, a technology planning best practice may stimulate two additional specific plans:

- Disaster recovery and business continuity plans are essential for protecting institutional data assets and ensuring that the business of the District can continue in the event of unforeseen circumstances. These plans deal with questions like: What if a fire or earthquake destroys the data center? What if a pandemic strikes?
- Data and information security plans that ensure compliance with FERPA, HIPPA, PCI and PII legislation, and other state, federal, and data security requirements. Central IT is responsible for guardianship of the digital data whereas other areas of the District are responsible for proper handling of paper documents.

Strategic Planning Approach

Most institutions plan for their information systems in much the same fashion that they plan for their physical architecture, using a facilities "master plan" approach. The master plan looks five, ten, or twenty years into the future and is used to make short-term decisions based on the institution's expected conformity with the envisioned future. Unfortunately, this approach is fraught with challenges because the pace of change in IT far outpaces that of buildings and the physical plant. Since 1965, Moore's "law" has accurately predicted that the processing power of integrated circuitry doubles every 18 to 24 months, resulting in a twofold improvement in computer performance over that period. This exponential rate of change makes it risky at best to rely exclusively on the master plan approach.

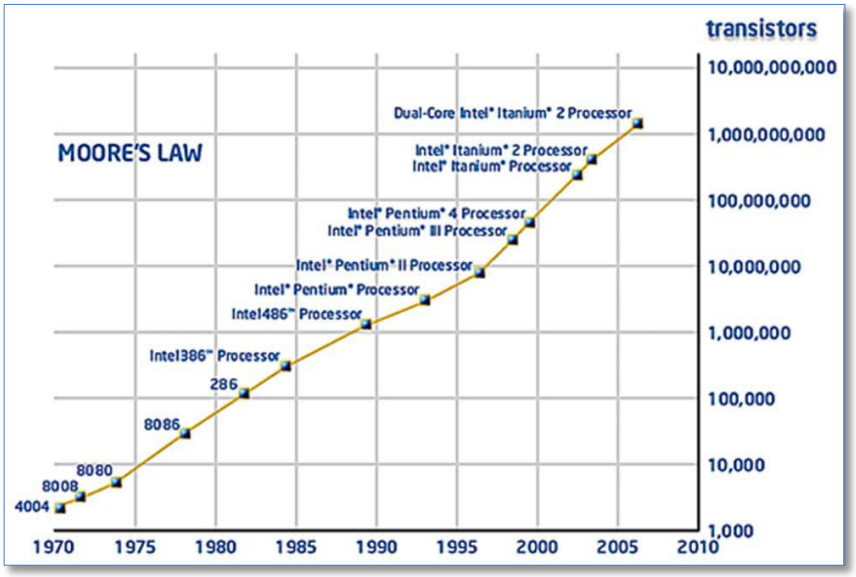

Figure C-2—Illustration of Moore's Law (Source: Intel Corporation).

An alternative/supplemental approach to IT strategic planning is to articulate a set of principles to guide information systems planning and decision making. Information systems principles remain relevant longer than any particular technology and therefore form a superior basis for long range planning. The principles should conform to the stated information systems philosophy. They should be determined through a process that engages the District and College communities, seeks consensus, and is regularly reviewed and updated for appropriateness and relevance.

Information Systems Philosophy

What are the District's guidelines, rules, policies, and practices related to technology? What should they be? These are essentially questions of information systems philosophy. An institution's information systems decisions and services should be driven by an information system vision and based on a well-communicated and commonly-accepted information systems philosophy.

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211

TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

APPENDIX D: PROCESS ANALYSIS, IMPROVEMENT, AND REENGINEERING

A process is a series of steps designed to produce a product or service. More precisely, a process is a logical and finite set of observable, interrelated (or hierarchical) work activities utilizing input, that, when performed in a predefined series, produces output (Laudato and DeSantis, 2008). Processes have internal and external customers and are independent of an organization's functional boundaries. Output is generated by a transformation of the input(s). All of the productive work performed in the District and Colleges—whether academic, student services, or administrative—is the result of work processes.

In a typical hierarchical organization, work processes are organized and managed in a series of functional areas, each responsible for optimizing the performance of their job function, and held accountable for the functional area's efficiency and effectiveness.

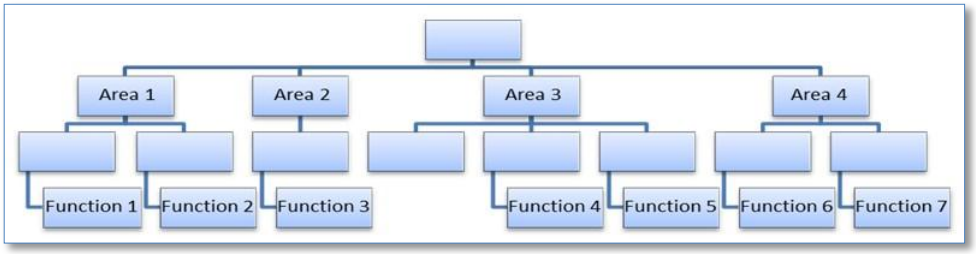

Figure D-1—Functional Structure within a Hierarchical Organization

All of the steps in a given work process may be contained within one functional area (e.g., financial aid) but most work processes are cross-functional, spanning the horizontal white spaces between the boxes on a hierarchical organization chart (e.g., the procurement process). Because each functional area typically is optimized for efficiency, productivity, and effectiveness within its limited area, most problems tend to occur at the point where outputs from one functional area are "handed off" to become inputs to another functional area.

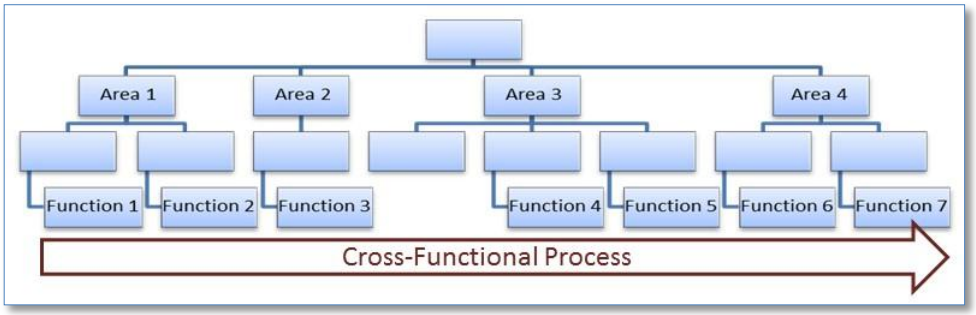

Figure D-2—Cross-functional work process.

Process analysis involves an in-depth review of existing work processes in functional offices with an aim to improve or reinvent those processes to improve their efficiency, effectiveness, accuracy, and performance, typically using technology as an enabler.

Often, processes that once made sense in relation to manual or legacy information systems are discovered still to be in use at institutions despite new capabilities offered by their administrative ERP systems. This can cause duplication of effort, unnecessary manual procedures, and unreasonable dependencies on particular staff. The process analysis effort involves identifying and delineating these processes and improving or reengineering those in need of remediation, along with creating appropriate documentation of new standard operating procedures.

Process analysis and review is necessary to understand how things are or should be done. Business Process Reengineering (BPR) seeks to re-invent processes to achieve dramatic improvements. It is not driven by technology, but technology is often essential for a successful implementation. In its absence, software acquisitions often are relegated to the bottom of a long project list as users and technicians do not understand desired outcomes.

Process-Review Best Practices

A best practice review of processes is essential to stewarding resources, elevating service delivery, and leveraging institutional investments. The greatest benefit from work process review, continuous process improvement, and BPR is achieved when the approach is comprehensive and the methodology becomes integrated into the institutional fabric.

Process analysis and mapping are usually implemented through multiple, facilitated sessions with a group of individuals who understand and participate in the process. The facilitator works with the group to create a shared understanding and description of each step in the process and identifies everything that could go wrong throughout the process. These “disconnects” then are analyzed for their causes and their impact on the process. Finally, solutions are developed and implemented that will eliminate disconnects and improve the process. In the case of business-process reengineering efforts, the original process may be completely abandoned and replaced with an entirely new process.

APPENDIX E: SUPPORT FOR INSTRUCTIONAL TECHNOLOGIES

SCCCD supports a mix of traditional (face-to-face), online, and hybrid course offerings and consequently supports a range of enabling instructional technologies. To provide a context within which to analyze SCCCD's instructional technology infrastructure, it is useful to define distance/distributed education in terms of the situations where the teacher and student are separated from one another by space and/or time. These relationships define a two-by-two matrix that can be helpful for classifying and discussing the range of instructional technologies appropriate for each specific modality of instruction.

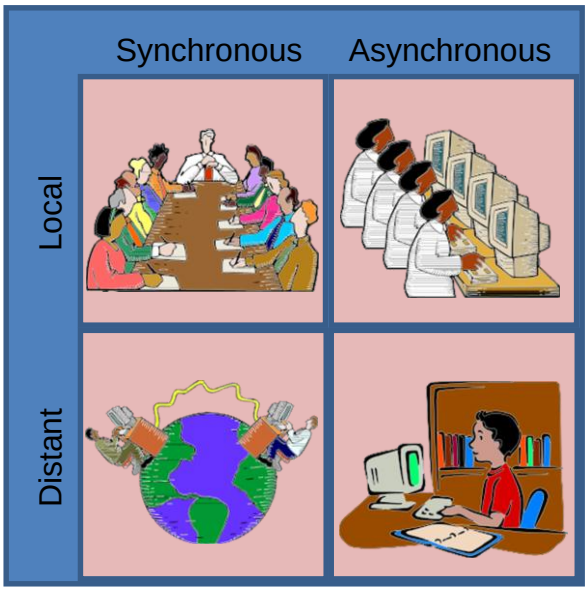

Figure E-1—Instructional technology matrix.

Instruction for a given course is almost never conducted exclusively within one of these four modalities, but rather is mixed among them.

For each of these four quadrants, the range of instructional technologies relevant to teaching and learning in that niche will be explored.

Local/Synchronous

The local/synchronous quadrant represents the traditional classroom environment in which the teacher and learner share the same space and time. Technologies in this category support the **presentation** of instructional material, **collaborative work** between the instructor and students and among students, activities encouraging student **engagement**, and the **capture** of classroom lectures and discussions.

Presentation

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211

TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

Presentation technologies enable the instructor or students to share images, annotations, and displays with the other members of the class. These typically include writing surfaces (whiteboards and chalkboards), flipcharts, data/video projection systems, monitors, document cameras, and overhead projectors.

Presentation technologies are evolving rapidly, fueled by forces similar to those fueling computer advancements.

Desktop and laptop computers no longer default to 4:3 aspect ratio displays. A 2012 study of then-current laptops designated "most popular," "best," "best gaming," "best value," and "top business" by online services and computer magazines showed that 95% of today's laptops employed 16:9 and the remaining 5% used 16:10 aspect ratio displays. None of the laptops that were reviewed had displays with the 4:3 aspect ratio common to most video projectors. The most popular native display resolution was the 16:9 1366 x 768 (63%) and most laptops incorporate the HDMI interface (71%) in addition to the VGA interface (79%).

Presentation software is increasingly more sophisticated. PowerPoint enables animations, transitions, digital ink, embedded media, and output of the slide presentation to the projector while simultaneously viewing notes on the computer. Cloud-based presentation software such as Prezi, which has a nonlinear "zooming" approach, offer visually stimulating alternatives. (Though some viewers complain of nausea caused by the rapid movements.) Specialized software such as SMART Notebook also have presentation capabilities, offering varied backgrounds, interactive applets, and annotation capability (see below).

- 3D projectors are attaining levels of quality and affordability that will enable wide scale use in the classroom for applications in chemistry, physics, biology, art, design, etc.
- Specialized medical projectors are becoming available that can render details sufficient to analyze x-rays and MRI images.
- Today's state-of-the-practice projectors can project two images/videos simultaneously (from two different sources), freeze frames, serve multiple computers, and simultaneously project displays from multiple wireless connections (as in "Hollywood Squares"). These capabilities are of limited use at the 4:3 aspect ratio because the resultant images will be too narrow, but are more valuable in 16:9 and 16:10 formats.
- Mobile devices are increasingly capable of supporting the instructor's classroom presentation activities. For example, the first generation iPad was able to connect to a data/video projector via VGA cable and iPad interface converter, but could only be used to display slide shows or videos. The iPad 2 is capable of displaying whatever is visible on the screen, enabling the device to be used to deliver PowerPoint or Keynote presentations as well as Web pages and native iPad applications. The ideal solution, to be able to roam the classroom untethered to the projector while utilizing the mobile tablet as a presentation and annotation device, is still elusive, but several applications can emulate portions of this ideal.
- LCD touch panels (such as the SMART Podium) or Tablet PCs allow faculty to make ad hoc additions and changes to prepared PowerPoint presentations, add illustrations using freehand drawing with a library of backgrounds and objects, and save a virtual whiteboard

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211
TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

of their classroom presentations for subsequent distribution to their students.

- Wireless digitizing tablets, such as the SMART Slate (formerly called the AirLiner), enable the instructor to control the classroom computer desktop remotely via wireless connection (usually Bluetooth), offering all of the functionality associated with the SMART Podium but, because it lacks the image, requiring greater eye-hand coordination to make effective annotations.
- Today's document cameras not only project an image of whatever document or three-dimensional object is placed under its camera, but also can capture and store the images (or video) onto portable storage media or directly onto an attached computer. They also typically have the ability to zoom into content as well as to highlight, mask, scroll, and compare content.

Engagement

Instructional technologies can help faculty engage students in classroom discussions and learning activities. For example, student response systems, commonly referred to as "clicker" systems, are a popular technology used to engage students. Clickers are hand-held devices that students can use to respond to faculty questions in the classroom. If they wish, faculty can then display their responses in an easy-to-interpret graph.

With virtual clickers (web-based), students use their laptops or smart mobile devices to respond wirelessly. Some of these virtual clicker systems (e.g., TopHat and Blackboard Poll) also support submissions via SMS (text messaging) from cellular phones, making it extremely likely that all students will be equipped to respond without either the student or the institution having to invest in specialized hardware.

Other solutions employed to engage students in the classroom include group games such as "Jeopardy." Sources for such games include textbook publisher resources, add-ons for SMART Board software, and learning object clearing houses such as Merlot. The presence of ubiquitous wireless network access for all students can enable applications for student engagement using portable computers and/or smart mobile devices.

Collaborative Work

Classrooms frequently need to support concurrent collaborative activities, that is, collaborative sessions between the instructor and students and among students.

Instructors can stimulate student collaboration through the use of flexible seating configurations that facilitate breaking the class into small groups for collaborative work and subsequently reconvening them as a whole class.

Many institutions are building classrooms to facilitate problem-based learning activities in which each break-out group has access to a shared large computer display (data/video projector or large-screen LCD panel), with the ability to reconvene as a full class to collectively review the results of their group work.

Software solutions are emerging that enable a room full of students with connected devices to participate in simultaneous group editing and content creation. For example, the Google Docs application allows multiple simultaneous edits of documents (with row-locking).

Lecture Capture

Lecture capture technology can be used to make a rich media recording of a classroom presentation, synchronizing audio and video of the instructor, the display screen (usually a PowerPoint presentation), and pen-based annotations. Captured recordings typically can be streamed live and/or archived for subsequent viewing by students. Some lecture capture applications allow subsequent editing to facilitate repurposing the recordings for use in distant learning initiatives.

Local/Asynchronous

The local/asynchronous quadrant covers situations where students gather together in the same space, but do not work together simultaneously as a class. This quadrant contains technologies that facilitate mentored individual and group work in a shared space. This niche is typically associated with the computer classroom, which allows students to work independently with easy access to the instructor.

Computer Classroom Management

Teaching a class in which every student has full access to a computer can be a challenge, as recognized by its classification here as a "local/asynchronous" event. Unless one is teaching students how to type or simplistic "do what I do when I do it" computing tasks, many faculty find it more effective to alternate between presentations of content, discussions, and hands-on work. Computer classroom management software solutions can support and facilitate this process of alternating between synchronous and asynchronous activities. They are particularly important in situations where the physical layout of the classroom is not conducive to the instructor being able to easily monitor and control student computer usage.

Some leading computer classroom management systems, also known as computer lab control systems, include offerings from NetOps, SMART (Sync), Insight, and Impero. These systems allow faculty to view and control any computer in the classroom, select the display of an individual's screen for group viewing, poll students, and control applications.

Figure E-2—Screen capture of SMART Sync classroom management software.

Computer Classroom Management software allows instructors to control computers in a classroom, share their computer screen with the students, and enable collaboration between groups of students.

Distant/Synchronous

The distant/synchronous quadrant includes technologies that support location-independent, real-time interaction and collaboration.

Video Conferencing Systems

The most mature technology in this niche is video conferencing. In classroom-based video conferencing, two groups of students are connected remotely over a high-speed communications line (usually via the Internet but ISDN and ATM lines also are still used) allowing real-time full motion video (30 frames per second) and high-quality audio interactions between the groups. This level of quality is a direct consequence of the use of hardware-based codecs (compressor–decompressor), which are more effective than software-only codecs; the amount of network bandwidth available to the conferencing session; and the configuration of the network to facilitate an acceptable quality of service.

Typically, the course instructor is located at the “near site” and facilities are constructed so that the students at the “far site” appear and behave as if they are in the “last row” of the instructor’s face-to-face class. If properly trained and prepared, participants in a quality video conference session can have a classroom experience similar to the traditional local/synchronous face-to-face experience.

Figure E-3—Example of classroom-based video conferencing.

High-definition systems, such as Polycom HDX, Cisco TelePresence, and Tandberg Telepresence, create a life-like environment, but are expensive to configure and require very high bandwidth. Remote participants can appear on large screens, with directionally-accurate audio, in life size to capture every nuance of facial expression.

Figure E-4—Example of high-definition video conferencing system.

Modern video conferencing systems can typically support up to four sites in a multipoint conference. Additional sites can often be accommodated by connecting the conference to an MCU (multipoint control unit).

Video conferencing systems also exist at the PC and mobile device levels, typically using software-based codecs. Because they target the desktop and use software-based codecs, these function at significantly lower levels of video quality.

Video-conferencing use at SCCCD also is discussed in more detail in *Communication and*

Collaboration Systems in the Information Systems Architecture section.

Another interesting technology solution can be created by combining video conferencing with lecture capture. Because video conferencing facilities typically use multiple cameras to capture video of the instructor and students at both the near and far sites, and because they provide microphone pickups for all participants, these audio and video inputs can be fed into a lecture capture tool, along with the image of the instructor's computer screen, to create a rich recording of the video conferencing session. Some lecture capture systems will also stream the session in near-real-time so people from all over the world can sit in.

Web Conferencing Systems

A second rapidly-evolving and increasingly important technology in this niche is Web conferencing, as characterized by applications such as Elluminate (now Blackboard Collaborate), Horizon Wimba (also now Blackboard Collaborate), Adobe Connect, Microsoft Lync, and WebEx. These technologies allow faculty to hold collaborative sessions with students connecting in real time via the Internet from home or office. The applications typically provide a shared whiteboard, file sharing, audio, video, polling, and breakout rooms. They can be used for virtual class sessions, exam preparation sessions, and virtual office hours.

Other Collaboration Systems

Emerging Web 2.0 and 3.0 synchronous collaboration tools hold promise for educational applications in this niche. Also, multi-user virtual environments (MUVEs) are interactive networked applications that provide three-dimensional virtual environments, complete with buildings, trees, rivers, stairways, animals, and people. Each of the objects in the MUVE is programmed to function automatically or at the control of a human. The human-controlled "avatars" can navigate through the virtual world and interact with other avatars or programmed objects.

Figure E-5—Screen capture showing a Second Life Island (UNC-Chapel Hill).

Distant/Asynchronous

The distant/asynchronous quadrant includes technologies that facilitate information **presentation**, communication and **collaboration**, **interaction**, and teaching/learning **support** in the mode where teacher and learner are separated by both time and location. This quadrant includes a rich and varied range of technologies encompassing software applications, multimedia resources, communications tools, and course management systems.

Presentation

The asynchronous presentation of course-related materials includes options such as course management systems (Blackboard), document management systems (such as the Blackboard content system and SharePoint), streaming media services, online image archives, and syndicated media distribution (podcasts and vodcasts).

Faculty are increasingly turning to screen capture applications to enable them to quickly and easily create their own multimedia content without having to be media experts. Applications such as Adobe Captivate, TechSmith Camtasia, Softchalk, and Articulate Presenter take a video capture of the computer screen and allow faculty to narrate their actions. Some of these screen capture applications can also be used to create interactive applications with branching and evaluation (see "Interaction" below).

Electronic Portfolios

Portfolios are collections of work designed for a specific objective, for example, to provide a record of accomplishments and skills or to document the mastery of a course, program, or degree requirement. The electronic portfolio can extend beyond a mere imitation of its paper counterpart. It can become a repository of multimedia artifacts and information that the owner, the subject of the portfolio, can share selectively with different audiences. For example, an advisor might be granted access to a more comprehensive view of a student's portfolio than would another instructor or a prospective employer. An ePortfolio system should:

- Enable students to track, document, and reflect upon curricular, co-curricular, and extra-curricular experiences and share them with multiple audiences, including faculty, potential employers, parents, advisors, accrediting agencies, etc.
- Enable academic program administrators to evaluate programmatic learning outcomes and student achievement, to facilitate formative evaluation of program goals, to compare benchmarks from accrediting agencies, to monitor and advise, and to perform curriculum reviews based on analyses of aggregate student performance data.
- Enable academic program administrators, faculty, and advisors to assess student academic progress and establish future learning goals
- Enhance the ability of the District, Colleges, Centers, departments, and faculty to fulfill their fundamental goal to educate the whole student.
- Enable faculty and staff to collect and display artifacts of their professional accomplishments and professional development for purposes of professional growth, promotion and tenure

CampusWorks, Inc.
1767 Lakewood Ranch Blvd. #305
Bradenton FL 34211
TEL. 941.316.0308
FAX. 941.954.2398
www.campusWorksinc.com

reviews, or to facilitate grant applications, etc.

- Enable alumni to continue to document subsequent educational, professional, and life experiences and share them with multiple audiences, including potential employers, accrediting agencies, etc.

Faculty and administrators at SCCCD have not expressed any strong interest in incorporating ePortfolios tools and processes into the curriculum, although some faculty use course-based ePortfolio-like assignments in individual courses. Fresno City College implemented Epsilen e-portfolios in 2008 and participated in the CCC pilot with Epsilen e-portfolios for two years. Faculty adoption was not significant and the software was not purchased as an enterprise application.

Summary and Status: Instructional Technologies

The two-by-two instructional technology matrix is a convenient way to classify and discuss the range of instructional technologies available to the District. Not all instructional technologies fit neatly in a single quadrant of the matrix and some technologies can be used to span quadrants. For example:

- The computer classroom management solutions discussed under the "local/asynchronous" quadrant can be used by the instructor to toggle back and forth between the local/synchronous and local/asynchronous modes by either taking control of all student computers or allowing them to be independent.
- Institutions are increasingly using lecture capture (a local/synchronous technology) to create rich media recordings of their classroom meetings and to subsequently edit the recordings to create multimedia resources for online courses where students study in distant/asynchronous mode.
- Video and Web conferencing sessions, technologies in the distant/synchronous quadrant, are typically recorded for use by students who missed or wish to review sessions (distant/asynchronous quadrant).

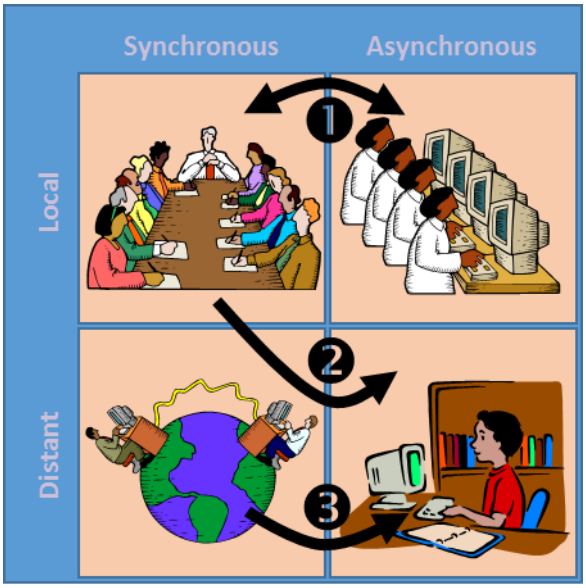

Figure E-6—Technologies span quadrants.

As the preceding review implies, there are typically many types of technologies that can be employed in any given technology niche and typically many different vendors that may offer competing solutions for each type of technology. Because it is completely untenable to acquire and support every vendor's competing offering, the institution must carefully select the palette of tools it wishes to acquire, deploy, and support.

APPENDIX F: SUPPORT FOR DISTANCE EDUCATION

The infrastructure required to support distance education initiatives parallels the infrastructure in place at physical campuses for face-to-face instruction. With few exceptions, all of the student, faculty, and administrative services offered in support of face-to-face instruction should have analogs in distance instruction. This distance education infrastructure consists of the following components:

- Instructional Design Model and Process: Distance education implies that the teacher and learner are not present in the same location and/or time. This basic fact implies that instructional sequences and materials must be developed in advance because they cannot effectively be created remotely in an ad hoc manner.
- This, in turn, implies the need for a course development process that can be best facilitated and informed by instructional design expertise. An instructional designer is a professional trained in learning and instructional theory and practice, and expert in the process of course development.
- Student Support Services: Students studying at a distance have unique needs and at some institutions the existing face-to-face student services do not translate well to distance education. Each of the services that have been created to serve the on- campus student must be examined to determine if it can adequately serve the student studying at a distance, namely, admissions, financial aid, billing, scholarships, veteran services, academic advising, counseling, tutoring, career services, grade and transcript services, disability services, diversity services, wellness and fitness activities, technology support, supervised testing services, etc.
- Faculty Support Services: As is the case with students, instructors who teach at a distance have unique support needs. For successful distance education initiatives, an institution must:
  - Provide access to easy-to-use instructional management system software to render online content, create and administer quizzes and surveys, etc.
  - Provide secure online grade books and tools to facilitate the grading process for nonobjective evaluation measures.
  - Facilitate communications between faculty and students by providing faculty (and students) with group and individual student email addresses and collaborative tools.
  - Provide copyright clearance advice and services to faculty members.
  - Provide technical training and support for content and test authoring tools.
- Administrative Support Services: An effective distance education program requires a supporting organizational structure to manage distance education needs assessment, program planning and development, funding, marketing, course development, and course delivery support services.
- Access to Academic Resources: To be effective, a distance education program must provide students with access to online library resources including encyclopedias, dictionaries, thesaurus, articles, journals, etc. Students studying at a distance should not be at a

disadvantage to those with regular access to campus academic resources.

- Academic Community: A successful distance education program should also provide opportunities for students studying at a distance to participate in the academic community, including student groups, clubs, events, memberships, and governance.
- Enabling Technologies: Many institutions make the mistake of equating distance education with a particular technology, such as mail, television, video tape, video conferencing, or the Internet. Instead, distance education should be viewed as a method of serving students who cannot be in the same room at the same time as the instructor. Distance education is enabled by whatever technologies can allow the instructor and students to achieve the instructional goals and objectives of the course. The primary enabling technologies for distance education at SCCCD include the Blackboard course management system, its plug-ins, and the CCC Confer web conferencing service. Video conferencing also has a small but diminishing role.

The degree to which these components must fully support students studying at a distance depends on the distance education aspirations of the institution. Institutions that seek to reach new populations beyond its county, state, or regional boundaries must design solutions that will work for students who will never physically visit campus. Those who use distance education to provide their existing constituencies with scheduling options can often implement less robust systems that depend on the students' occasional presence on campus.

APPENDIX G: REFERENCES

CampusWorks, Inc. (2011). A Best Practice Technology Support Model. Florida. EDUCAUSE. (2008). EDUCAUSE Core Data Service Fiscal Year 2008 Summary Report Retrieved from www.educause.edu.

EDUCAUSE. (2009). EDUCAUSE Core Data Service Fiscal Year 2009 Summary Report. Retrieved from www.educause.org

EDUCAUSE. (2011, October), Core Data Service Almanac. Retrieved from http://net.educause.edu/ir/library/pdf/CDA1102.pdf

Hammer, Michael and Champy, James. Reengineering the Corporation: A Manifesto for

Business Revolution. (New York: Harper Business, 1993)

New Media Centers Consortium (2013). The Horizon Report. Retrieved from http://www.nmc.org/horizon-project/horizon-reports/horizon-report-higher-ed-edition

Laudato, Nicholas C. and DeSantis, Dennis J.. Fundamentals of Process Mapping (EDUCAUSE MARC, 2008).

Selig, G. J. (2008). Implementing IT governance: A practical guide to global best practices in IT management. Zalttbommel: Van Haren Publishing