

El Camino Community College District Technology Master Plan Table of Contents:

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Technology Vision

To enhance El Camino College's (ECC) vision to be the college of choice for successful student learning that transforms lives, strengthens community, and inspires individuals to excel by providing the technology services and resources, required by our faculty, staff, and students.

Technology Plan Scope

For the purpose of this plan, technology is the secure storage or transmittal of data for use by ECC staff, faculty and students. It encompasses the necessary infrastructure, multimedia systems, hardware and software systems, and Internet required to provide secure and accessible computing systems for the academic and administrative endeavors.

Technology Landscape

This Technology Master Plan will align with the goals and strategies of the overall Comprehensive Master Plan, Educational Master Plan, Facilities Master Plan, and Staffing Master Plan. It will also coordinate with such additional plans as Enrollment Management Plan and Distance Education Master Plan.

College Mission and Integrated Planning

The El Camino College Mission is the foundation for all planning processes. The Mission reads, *“El Camino College makes a positive difference in people’s lives. We provide excellent comprehensive educational programs and services that promote student learning and success in collaboration with our diverse communities.”*

Supporting the Mission are Strategic Initiatives, or Collegewide goals developed to help focus efforts toward student success and institutional effectiveness. Through Strategic Initiative F (Modernization), the College will “support facility and technology improvements to meet the needs of students, employees, and the community.” The Technology Plan supports and implements the Mission and Strategic Initiative F.

This Technology Master Plan will align with the goals and strategies of the overall Comprehensive Master Plan, Educational Master Plan, Facilities Master Plan, and Staffing Master Plan. It will also coordinate with such additional plans as Enrollment Management Plan and Distance Education Master Plan.

Technology Plan Goals & Action Items relate to Areas of Strategic Focus of the Educational Master Plan:

1. ***Teaching and Learning*** – to support professional develop, innovation, methods that work, student learning and development
2. ***Access, Progress & Completion*** – to support student access and equitable and timely progress and completion
3. ***Enrollment Management*** – to stabilize enrollments, ensure adequate growth
4. ***Institutional Process Improvement*** – to ensure efficiency and effectiveness of all internal college and student enrollment processes, and reduce roadblocks

Information Technology Strategies

1. To provide up to date technology to ensure lifelong learning to our diverse student population.
2. To provide ongoing technology support necessary for faculty, staff and students.
3. To provide a variety of delivery methodologies and technologies to ensure flexibility in time and/or location for learning opportunities and learning management systems (LMS).
4. To ensure the institutional commitment to a viable and cost effective technology environment.
5. To ensure commitment to providing security, privacy, and protection of all systems, properties and data.
6. To ensure a continuing commitment to community, government, and corporate partnerships to meet our mutual needs.
7. To ensure an interwoven support structure and stewardship of resources for a quality technology environment.

Campus Technology Survey

The Campus Technology Survey was designed to gather information on technology use and device ownership of students and employees in order to assess campus needs, inform service

delivery, and plan for technology. The baseline survey (spring 2013) revealed that 94% of students owned a laptop or desktop computer, while 80% owned at least one smartphone. A brief device-use survey administered in English & math classes in Fall 2016 found that 97% of these students own a laptop or desktop, while 94% own at least one smartphone. 41% own at least one tablet, compared to 28% three years ago.

Data was also collected from students to support planning Wi-Fi and BYOD (bring your own device) initiatives. Over 96% of students brought at least one Internet-connecting device to campus. Of those, 54% bring only one, 30% bring 2, and 16% bring three or more devices to campus regularly.

The College intends to repeat the survey in Spring 2017 and every two years thereafter. Results of the surveys are reviewed by both the ECC Technology Committee and the Academic Technology Committee to track progress on campus and academic technology improvement efforts.

Top Issues Facing Technology in Higher Educations

As part of the development of this plan, the ECC Technology Committee reviewed the top issues facing technology in higher education to determine the most critical issues to address or to support at El Camino College. These issues affected varying scopes, including the College, Classrooms, and Students. The top issues identified by scope, ordered by priority, are as follows:

The College: Institutional needs, opportunities, and challenges

1. Information Security
2. Institutional Data Management
3. Information Technology (IT) Funding Models
4. IT Workforce Hiring and Retention
5. IT Organizational Development
6. Americans with Disabilities Act (ADA) Compliance
7. Online Forms and Processes
8. Enterprise Application Integrations
9. Business Intelligence and Analytics
10. Data Standards and Data Exchange
11. Mobilization

Classrooms: Faculty pedagogy and professional development

1. Faculty and Online Education
2. Educational Technologies
3. Digital Literacy (faculty and staff)
4. Shift to Deeper Learning Approaches

5. Open Educational Resources (OER)

Students: Tracking and supporting student learning and success

1. Student Success Technologies
2. Measurement of Learning
3. Digital Literacy (students)

Several internal and external resources were used to identify these issues. More detailed information and resource citations are located in Appendix D.

Technology Governance

Technology Committee: The Technology Committee serves as the consultation committee for campus-wide technology planning. The committee evaluates needs, strategizes solutions, and proposes recommendations for College technology. The committee develops, monitors and evaluates implementation of the College Technology Master Plan.

The Technology Committee, made up of a cross section of faculty and staff, meets monthly to discuss and evaluate all forms of technology on campus. The Committee brings forward technology needs and ideas from across the campus, and relays information to staff and faculty of changes taking place on campus. Technology project management will workflow new initiatives under the rules and guidelines as established by the Technology Project Management subcommittee to the Technology Committee as whole for review and adoption. This subcommittee may then act on behalf of the whole College to receive/review for completeness and present complete Project requests to the whole Technology Committee. Technology standards will be developed and reviewed annually by the Technology Standards subcommittee to the Technology Committee under the same process as the Projects subcommittee. As the El Camino Community College District (ECC) has evolved, the Technology Committee has provided a wide spectrum of suggestions ranging from the use of technology in the classroom to the email system currently used by ECC. Recommendations from the Technology Committee are presented to the Superintendent/President's Cabinet who in turn works with the College's committee structure to incorporate technology initiatives in the District's overall planning processes. (For membership see Appendix A.)

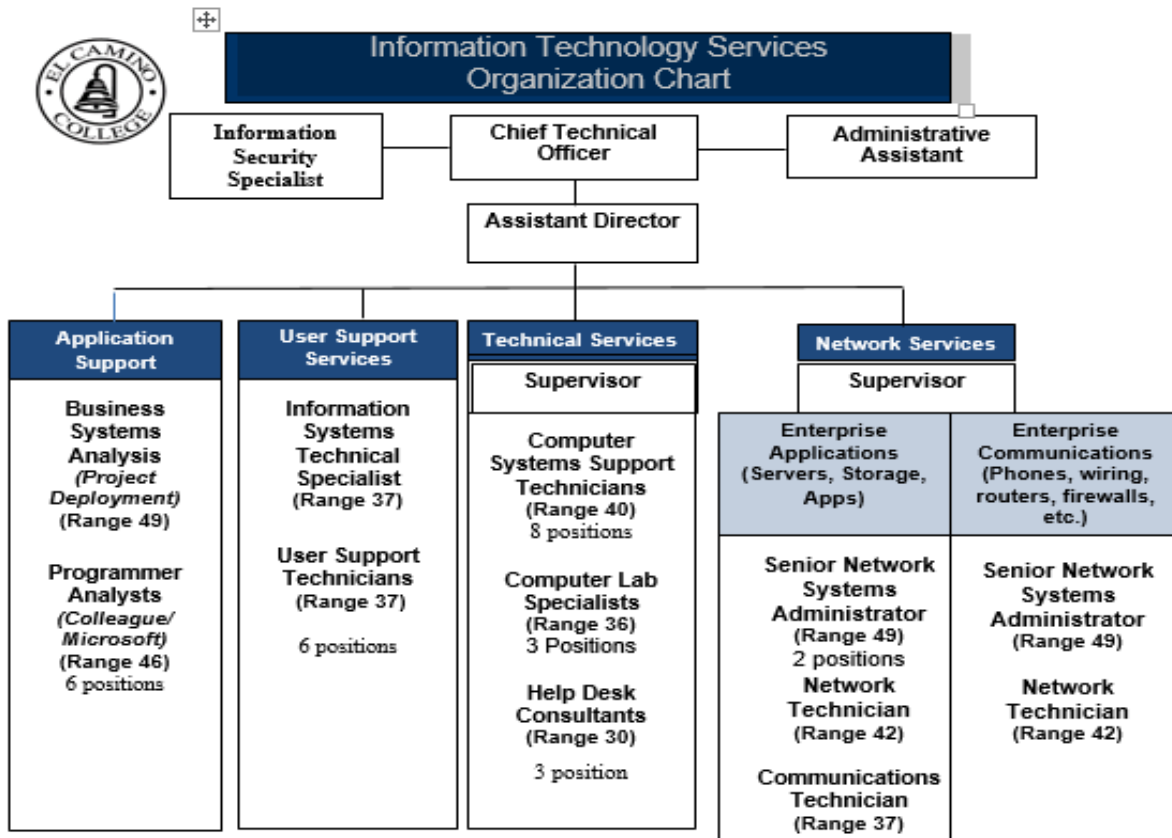
This Technology Master Plan spans a five year period from 2018 to 2022 and is organized to provide background, current environment and recommendations originating from different members of the campus community. Working with the Comprehensive Master Planning Committee and the Planning and Budget Committee, opportunities to introduce and enhance technology in the District will be developed as the campus grows and moves forward.

The College Technology Committee works with the Academic Senate Technology Subcommittee to understand and develop technologies in support of academic endeavors, expanded global teaching and learning, and human interaction.

Information Technology Services

The mission of Information Technology Services is to enhance El Camino Community College District’s optimal implementation of technology through fully integrated systems, services, networks, and security.

The Chief Technology Officer supervises the Assistant Director, Administrative Assistant III and Information Security Specialist. The Assistant Director supervises the Technical and Network Services Supervisor and the Applications and Development staff.



Applications and Development Services

Application Support is responsible for the development, deploying, operating, and maintaining of the software applications used by the campus. The unit is responsible for the software development and maintenance in support of the College’s student information system Colleague by Ellucian, the student application to the College CCCApply, Financial Aid disbursements, and MIS reporting of student population information to the California Community College’s Chancellors Office. In addition the unit develops or implements and maintains applications that

can be accessed on the MyECC portal site to provide real-time student information such as unofficial student transcripts and reporting services for administrative staff. Finally, the unit is charged with supporting the Human Resources area with MIS Employee reporting, Faculty Contracts and LACOE human resources and payroll interfaces in addition to supporting Fiscal Services and Purchasing for the Accounts Payables, General Ledger, Accounts Receivables, Purchasing, and Fixed Assets systems. The external LACOE financials and labor distribution interfaces are also maintained and supported by this unit.

Network and Telecommunications Services

This unit maintains and operates the College's telephony and data infrastructure, (2) maintains and operates the College's data systems, including Ellucian Colleague, and (3) acquires and distributes new computing equipment including voice and data network equipment-

The unit is responsible for maintaining the online portal environment where Students, Faculty, and Staff access many of the previously manual processes. Student application and enrollment process are completely online using a combination of the Chancellor's Office OpenCCCApply and the MyECC portal. Faculty are submitting grades and no shows online and printing their class rosters themselves. A wide variety of student services are available online including admission and enrollment, fee payment, buying a parking sticker, account summary, test scores, financial aid status and award letters, educational plans, grades, the bookstore, scholarship applications and unofficial transcript requests.

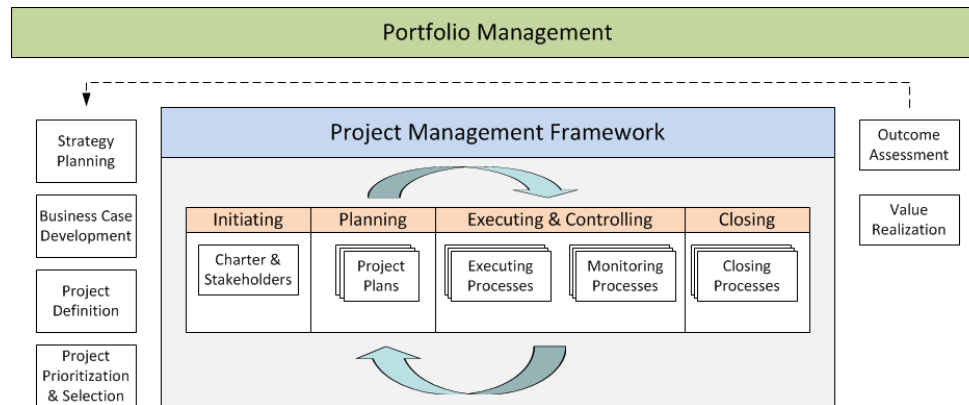
Technical Support Services and Help Desk

This unit acquires and distributes new computing equipment including PCs and printers, creates and "pushes" Operating Systems, classroom and office computer images and application program workstations images, deploys virtual desktop workstations and virtual file servers, and performs warranty repair service on all PC workstations.

The performance of the unit is measured by the number of help desk tickets assigned and closed during the period, the number of hours required to close all the tickets, the average number of hours and days to close tickets.

Technology Project Prioritization Principles

The Technology Committee will follow a structured process for prioritizing projects. As a result of this prioritization, projects approved by the committee will adhere to disciplined project management process describe below. Throughout the course of project initiation through closure, reflections on progress and learning outcomes will be collected to ensure future project embed/reflect these learnings and become ECC's knowledge base as organization process assets (OPAs). The Technology Committee will follow the more universally accepted principals of the Project Management Institute, the organization that oversees the primarily accepted Project Management Certification standards, and creator of the Project Management Book of Knowledge which constitutes the primary handbook of all certificated Project Managers. These principles are described below.



Source: Courtesy of W. Biernacki, CEO Enterprise Outcomes ©

Project. A temporary endeavor undertaken to create a unique product, service, or result.

Portfolio Management. A portfolio refers to projects, programs, sub-portfolios, and operations managed as a group to achieve strategic objectives.

Project Scope Statement. The description of the project scope, major deliverables, assumptions, and constraints.

Project Management. The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. Project Management is accomplished through the appropriate application and integration of the 47 logically grouped project management processes (Refer to Appendix C).

(Source - *Project Management Book of Knowledge 5th edition* www.PMI.org)

1. Five process groups and ten knowledge areas will provide the framework for projects.
2. The five Project Process Groups as defined by PMI.org are:
 - a. **Initiating.** Processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase
 - b. **Planning.** Processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve.
 - c. **Executing.** Processes performed to complete the work defined in the project management plan to satisfy the project specifications.
 - d. **Monitoring and Controlling.** Processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes.
 - e. **Closing.** Processes performed to finalize all activities across all process groups to formally close the project or phase.
3. The ten knowledge areas of project management as defined by PIM.org are:

- a. **Project Integration Management.** Processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.
 - b. **Project Scope Management.** Processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully.
 - c. **Project Time Management.** Processes required to manage the timely completion of the project.
 - d. **Project Cost Management.** Processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs to ensure the project can be completed within the approved budget.
 - e. **Project Quality Management.** Processes and activities of the performing organization that determine quality policies, objectives, and responsibilities to ensure the project will satisfy the needs for which it was undertaken.
 - f. **Project Human Resource Management.** Processes that organize, manage, and lead the project team.
 - g. **Project Communication Management.** Processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.
 - h. **Project Risk Management.** Processes required for conducting risk management planning, identification analysis, response planning, and controlling risk on a project.
 - i. **Project Procurement Management.** Processes necessary to purchase or acquire products, services, or results needed from outside the project team.
 - j. **Project Stakeholder Management.** Processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.
(Source - Project Management Book of Knowledge 5th edition www.PMI.org)
4. Inputs, Tools/Techniques, and Outputs from these process groups and knowledge areas may include the following but will be tailored based on size, complexity, timing, and budget. (For more in depth breakout of the Project Management processes, see Appendix C)
 5. Prioritizing technology projects will be based on the inputs provided by the Technology Committee with an emphasis/preference on the following (Technology Master Plan 2012):
 - a. Projects with clearly defined benefits for the faculty/student learning and teaching environment;
 - b. Projects that promote information and data security, and facilitate compliance with regulatory mandates;

- c. Initiatives that facilitate collaboration among programs or departments for the design, implementation and the use of common applications;
- d. Initiatives meeting common objectives, yet capitalizing on local autonomy and using local strengths;
- e. Projects that further faculty, student, and staff technological literacy;
- f. Projects that generate new revenue or reduce costs; and;
- g. Projects that free up resources.

Project Design Principles

1. Prior to designing any application, solution, or process, the basic or underlying business processes must be reviewed and assessed. Only if the business process is correct and the proper automation of that process be achieved efficiently. If the business processes not as efficient as possible, that process or processes need to be reviewed and revised by the appropriate consultative processes.
2. Data should be collected once, electronically, as close to its point of origin as possible.
3. New applications should be easier to use than the manual or automated systems they replace.
4. The need for clerical or manual intervention should be minimized with the adoption of new applications.

Data Governance

In the simplest terms, a data governance framework is a system of rules, policies, procedures, and responsibilities clearly establishing who can do what with what information, how and when those things can be done, and what each data element really means to all users. An effective governance initiative promotes data quality and ensures information is both secure and available to those who should have access to it. Because such a framework is ideally integrated seamlessly throughout an institution, administrative silos, long-held practices, institutional politics, and resource limitations are more likely to be greater obstacles than any purely technical challenge. A multi-levelled data governance structure should serve the functions of governance council, stewardship committee, and information custodians. It's important to establish a framework that's appropriate for ECC.

Senior sponsorship is required to ensure compliance. Consultation throughout the development process will ensure that the framework is not seen as strictly and arbitrarily imposed from above. Support of managers and frontline staff will be done through emphasizing the benefits of a good data governance framework to an office's functionality (i.e. clear procedures for creating, maintaining, and handling information will help, not hinder, the operation of your unit). Consciously implementing a Data Governance framework in logical phases has several advantages. First, it allows you to identify and celebrate concrete successes early in the process, which is crucial to developing buy-in and momentum. Second, like any major task, realizing something as broad and involved as an institution-wide data governance framework is more manageable when deliberately and thoughtfully divided into predetermined component parts.

Security Planning

Information security (InfoSec) concerns are beginning to take center stage within the educational sector. The importance of creating a well-rounded and multi-layered InfoSec strategy has never been more urgent. Daily news headlines are filled with stories of Ransomware variants and frequent breaches of sensitive Personally Identifiable Information (PII). As an example of the rapidly shifting tide of targeted sectors by the cyber-criminal community, in 2014 the healthcare sector wasn't even on the radar screen. The following year (2015), healthcare, which hosts millions of records protected by HIPAA¹, was at the top of the list. As more and more sensitive financial and personal data is sold on the black market (Dark Web), cyber-criminals are shifting their sights to more lucrative hunting grounds that offer an easy payday. HIPAA data has become a favored target almost overnight, so too will data protected by the Family Education Rights and Privacy Act (FERPA).

Most people see the necessity of securing computer equipment. Machines cost money and therefore have value unto themselves. But considering why organizations are so willing to spend large amounts of money on their computer systems - to store, access, and transmit information - the value of that information becomes more apparent. In the education community, information about students, staff, and other resources is far more valuable to the operation of school buildings, campuses, and district and state education agencies than even the most costly equipment.

Education information is often considered to be confidential by its very nature - that is, certain types of sensitive information (in particular individually identifiable student and staff records) must, by law, be protected from all parties who do not have a verifiable need-to-know. In addition to numerous state and local laws designed to preserve the confidentiality of education records, the Family Education Rights and Privacy Act of 1974 (FERPA) is a federal law designed specifically to protect the privacy of a student's education record. It applies to all schools that receive funding under an applicable program of the U.S. Department of Education, and is but one example of legislation enacted specifically to protect confidential student information maintained in education record systems.

Education data can represent years' worth of investment in collection and maintenance activities, and may be irreplaceable as an asset. What would happen, for example, if a school "lost" grade information and was unable to calculate cumulative grade point averages for its graduating class. Information resources residing in the various administrative and academic computing systems are vital assets. These assets must be available and protected commensurate with the value of the assets. Measures shall be taken to protect these assets against accidental or unauthorized access, disclosure, modification or destruction, as well as to assure the availability, integrity, utility, authenticity and confidentiality of information. Access to state information resources must be appropriately managed.

¹ Health Insurance Portability and Accountability Act

One such methodology is a security vulnerability assessment of the computing infrastructure in order to determine the current state of computing resources. The vulnerability assessment attempts to identify threats that could affect the confidentiality, integrity, or availability of College information resources. Results of the assessment along with recommendations for improving security practices will be distributed to departments. Current advances in information technology have contributed to a rise in the accessibility of information, ease of use, productivity and efficiency. However, there are significant risks involved with this type of advancement. Security threats and breaches have increased and crimes are committed with more malice. All employees and students share the risk and therefore share the responsibilities of security awareness and risk mitigation or prevention. (For more detail, see Appendix B)

Information Security Responsibilities

Information security is a responsibility shared by the community. All members of the community are considered Data Users. In addition to the responsibilities of Data Users, members of each role are required to fulfill specific responsibilities, including incident reporting and handling. Stewards, Managers and Information Service Providers are responsible for establishing security policies and procedures. Users are expected to be aware of and to adhere to these and other College policies.

Data Users:

Every member of the College community is a Data User, and as such is responsible for appropriate protection of College information. Data Users are tasked with understanding and adhering to College policies, and with complying with best practices in information security as established by the College Information Security Office.

Heads of Academic and Administrative Units, Managers, and Supervisors:

College leadership are responsible for assuring that all individuals who fall within the scope of their authority are appropriately educated in the information security requirements of their roles. They also encourage information security through User training and awareness.

Data Stewards:

Data Stewards are accountable for the data under their stewardship. Stewards classify data, authorize access, and promote information security within the relevant user community. Faculty are considered Stewards of their own research and course materials; students are considered the Stewards of their own work (where it does not form part of the academic record).

College Chief Technology Officer (CTO):

The CTO is responsible for overseeing College network security; establishing required minimum security standards for handling College information; overseeing technology policy; managing an information security training and awareness program; and handling information security incidents.

Information Security Specialist (ISS):

The ISS is responsible for providing security guidance and assessment on all facets of the College's information security posture and architect, develop and implement security awareness training programs, and coordinate and conduct information security event management. (see Appendix B for current assessment status)

Disaster Recovery Plan (DRP)

The College will create, under the guidance of the Chief Technology Officer and in conjunction with input and advice from the College's Technology Committee, an enhanced disaster recovery plan that mitigates or offsets service disruptions from minor system failures to the loss of the entire infrastructure. The plan will include information about the recovery team, who they are, how that can be reached, where they meet, and what they do. It will also include sections that describe system restart procedures including system passwords, maintenance, hardware and software contracts and vendor contact information, and information for renting hardware systems for rapid recovery. The plan will be stored at two secure locations on campus and at least one location off campus.

The DRP will cover network and host vulnerability assessment, security architecture design, network and host security implementation, virus and intrusion detection, incident handling and forensics and encryption. The plan will balance the need for rapid recovery, business continuity, and security with an open, collaborative networking environment. To be effective, security practices cannot rely completely on technological solutions. Policies are required to define clearly faculty and staff responsibilities relating to student data and the security of their workstations. The planning process must involve the owners of the primary data systems as well as faculty and staff leaders as to create a broad base of consensus for the outcome.

Technology Training

College faculty, staff, students, and administrators rely on technology to perform many of their daily job functions. New technologies become available almost annually and are subsequently purchased and implemented. If employees and students are to perform their jobs effectively and efficiently or learn effectively; timely training after installation is critical. The complexity of technology at El Camino College requires the Professional Development and Learning Department and ITS to work closely together to ensure that faculty and staff are being trained in the use of the latest software in use at the campus including Ellucian Colleague. The College must continue to assure that training is offered, and that it meets ADA and 508 compliance standards for access. The College will provide infrastructure and technology support for compliant assistive technology and assisted learning requirements to ensure equity for all students and employees.

Life Cycle Replacement Program (LCRP)

1. ECC's LCRP is a 5-year program designed to ensure a smooth continuous equipment replacement process to maintain the institution's capabilities and inventory to meet the growing and evolving needs.

2. The LCRP program is designed to identify and replace outdated or obsolete equipment annually and within budget constraints.
3. ITS will issue a memorandum annually of the equipment targeted for replacement the following fiscal year in conjunction with the budget planning cycle. This list will be derived from the automation help desk database and asset management records; and will identify what equipment and who the listed user is. Equipment that is not identified to IT, is procured separately, or moved without notifying the Help Desk, may not be included in the database and would not be identified for replacement.
4. ITS will bulk order all LCRP purchases on July 1. Upon receipt of the equipment, ITS will prepare the equipment and, through Property, have it issued to the designated user. ITS will consolidate the LCRP requirements with received new purchases into a single requisition.
5. Administrative Services will provide ITS with a funding target available for the next fiscal year by March to allow for determining the amount of equipment that can be replaced.
6. Replaced equipment will be processed for disposition in accordance with standing procedures.

Out-of-Cycle Replacements. It is recognized that not all computer equipment needs can wait for the July 1 ordering date. If equipment must be ordered out-of-cycle, the procedure followed is similar to the normal purchase order process.

1. Individual departments will prepare a requisition (including the department account number) for the equipment needed and they are then to send the requisition to ITS, where the orders will be reviewed for support, compatibility, etc.
2. The requisition will be sent for normal processing through the Purchasing Office.

Technology Funding

El Camino College continues to work to achieve a balance between the desire to expand the technology infrastructure and its ability to provide the resources necessary to support and upgrade services. There are procedures in place to guide the acquisition of new technology facilities, particularly computer laboratories through a bi-annual Planning and Budget cycle and using the collegial consultative processes to review and approve new technology initiatives. The College has allowed requests for additional computer laboratories, new technology, software, and systems to enhance the learning environment. While there is a central approval process for new technology, it is still possible for departments to utilize grant fund resources in addition to those from the General Fund. The challenge for the College is stabilize funding for technology hardware and software so as to eliminate the excessive spending of left-over funds at the end of each fiscal year with a predictable cycle of upgrade and replacement that the College community understands and uses.

The Planning and Budget Cycle process allows for consistent and organized budget build for the College. The TracDat system is used to input requirements and data into a single system for review and processing. Once each unit has entered its requirements, the budget review process is conducted. At the conclusion of the review and approval phase, each of the primary divisions (Academic Affairs, Administration Services, HR, Student and Community Advancement, Public Affairs and Marketing, Institutional Research, Grants, and Foundation) will conduct a review of their requirements for technology needs and possible projects for the upcoming year with the

Chief Technology Officer to determine compatibility, feasibility and priority. Requirements that need ITS support will be considered in terms of availability of that support to help prioritize the overall ITS workload within the ITS annual work plan. The ITS annual work plan addresses the need for operations, maintenance, repair, life cycle/upgrades, and technology projects.

ITS is charged with ordering, receiving and issuing all computers and network equipment as defined above in Technology Plan Scope. While each department can order/fund new software, ITS is also tasked to renew all annual software licensing for the following years until the original requesting department indicates they no longer need that license. This is done primarily to help ensure licensing compliance and accountability for the entire College. After the first year purchase by individual departments, Finance will then transfer the amount required for the licensing renewal to ITS and ensure that that funding amount is maintained. ITS will coordinate with Finance on the annual software licensing requirements through the budget and planning cycle. Please note that there are unique object codes which must be used for computer purchase or replacement/upgrade funding. Departments will refer to current published account codes and schedules as they change annually. Information Technology Services will create and submit a requisition(s) on your behalf, following approval of your request by your Division Administrator.

Current sources of technology funding are:

1. Technology and Telecommunications Infrastructure Program, TTIP/Tech II
2. Instructional Equipment/Library Materials
3. General Funds
4. Capital funds set-asides for new buildings such as Measure-E (Bond Funds)
5. Grant and categorical funding (i.e. Title III/V Federal Grants, CTE, and CalWORKs)
6. ECC Foundation
7. California Community College Chancellor's Office supported projects and initiatives
8. CCCCCO Foundation provided purchasing agreements

Changing Conditions

All academic, administrative, and student support functions of the College are now dependent on very complex computer networking and data systems that interconnect departments across the District, the District with state and federal governments, and the College with higher education institutions across the country and throughout the world.

The move to an online registration process away from a manual forms process has dramatically altered and redefined the duties and responsibilities of the programming staff. Prospective students can apply from anywhere in the world using the internet. Admissions and Records (A&R) staff redirect prospective students expecting to apply in person to the nearby kiosk computers to apply online.

ECC will undertake to institutionalize business processes improvement reviews and look towards a regular cycle of process improvements. While a variety of methodologies are available, ECC ITS and the Institutional Research Department will use the methods that most closely meet the needs of the processes being reviewed. PMI, Six Sigma, LEAN, ITIL, etc., all offer unique

perspectives on different systems and processes. More of the manual processes done by the College are to be converted to electronic processes or media with the requirement of integrating automation, in addition to new processes that previously were prohibitive because of the intense manually resources required. The College will pursue an overall strategy to reduce or eliminate paper forms through use of an electronic scanning, archiving, and storage retrieval system.

The California Community College's Chancellor's Office (CCCCO) has initiatives in play that will allow for California Community Colleges to leverage common automation platforms the CCCCCO tech center is developing as a cost savings to the individual college and to move toward a single student identity with associated common college application requirements. These new initiatives represent cost savings, however, the interfaces to a college's SIS are historically a college's responsibility to create and maintain.

The California State legislature has enacted into law Senate Bill (SB) 1456 providing for new mandated requirements focusing on interaction between the California Community Colleges and their students. These new requirements, commonly known as the Student Success Act, will mean evolving new ways to execute those required interactions and how to record and report the interactions required by the law.

Summary

This technology plan deals with the new technologies students are bringing with them into the classroom. It also anticipates the emergence of environmentally friendly technologies that are more cost efficient and able to yield greater returns on investments. The plan looks ahead to a technology infrastructure that is not yet reality but will be by the end of this plan period. This new infrastructure will be characterized by virtual and mobile technologies and cloud computing that will support affordable, highly customizable work environments that will exist almost entirely in cyber space. The College recognizes the impact that wireless technology, the Internet of Things (IoT), increased availability and variety of computing devices accessing the network. ECC will continue to improve and increase the infrastructure and accessibility while providing a more flexible and robust security architecture. ECC will need to investigate and explore making mobile devices and computing more readily available through a variety of equity programs and allowing for the creating of a bring your own device (BYOD) culture amongst both faculty and students while supporting adaptive learning and assistive learning technologies throughout the campus community. The College will explore innovations in instructional delivery methods to expand our students learning experiences while conducting regular Institutional Process Improvement cycles to improve overall efficiency and effectiveness of programs, systems, and processes.

The focus of this plan is deploying new technologies that can enhance learning for student access and success, strengthen global College perspectives, link all members of the College community, and provide resources in a climate of drastically lower fiscal resources. The theme of the next five years is to deploy technology solutions that will help the district maintain critical services in a climate of unknown budget direction and where ECC will be called upon to do daily operations and new projects more efficiently and effectively.

These seven technology strategies described on Page 2 above will be aligned with the 4 areas of Strategic Focus. These areas of concentration are Enrollment Management, Teaching and Learning, Access Progress, Completion, and Institutional Process Improvement (also on page 2). With these areas, more specific goals, objectives, and measures are developed to focus on the needs and requirements necessary to meet the strategies.

References:

District Mission and Strategic Plan 2015-2020 (Board Policy 1200)
El Camino Community College District Comprehensive Master Plan, November 2016
El Camino Community College District Education Master Plan, December 2017
El Camino Community College District Facilities Master Plan, January 2017
El Camino Community College District Staffing Master Plan, TBD 2017
El Camino Community College District Distance Education Master Plan, November 2016
El Camino Community College District, Information Technology Master Plan, 2012
PlanNet, Information Technology Assessment, January 2015

Technology Plan (Goals, Objectives, & Measures) and Alignment to ECC EMP Focus Areas²

Goal: Complete College without walls concept with more focus on distance education, both for instructor and student training and access. (EM, APC, IPI)

Objectives:

Provide student Mobile Connection needs for on and off-campus requirements such as hardware/software (laptops/software) to enable information access in a timely manner, both on and off campus through INTERNET or wireless access to the network.

Provide support to Distance Education programs and global instructional technologies and learning management systems (LMS).

Provide and support ADA/508 compliance for all students and staff/faculty.

Provide and support requirements for compliant assistive technology and adaptive learning.

Measures:

Provide systems and integration/convergence of disparate technologies to improve learning environments regardless of location

Be able to provide ADA compliant adaptive technologies as required.

Goal: Provide Campus Automation, Telecommunications, and Security Program (IPI)

Objectives:

Provide for security policies and procedures for applications software

Security Architecture will be developed and implemented

Ensure users know where to go to get information on computer/technology systems.

Measures:

User Reference and Security Handbook developed and available to all users

On-line Security procedures in place on ECC Web Page

Security Architecture is documented and adhered to.

Goal: Develop and provide information on support planning and decision-making systems for the ECC. (IPI)

Objectives:

² Focus Area Legend: APC=Access, Progress & Completion; EM=Enrollment Management; IPI=Institutional Process Improvement; and T&L=Teaching and Learning.

Provide stable operational systems.
Investigate new technologies for executive or decision support systems.
Promote data standards
Support required external reporting.
Provide timely, flexible, and reliable data research tools and data presentation tools (Dashboards)

Goal: Develop and implement assessment strategies to monitor and evaluate technology-based courses. (T&L)

Objectives:

Develop evaluation criteria and regular survey instruments
Implement a process to assess periodically the quality of technology-based courses and programs
Apply strategies of review and revision to increase the effectiveness of technology-based courses

Measures:

Show that evaluation criteria are in place and surveys are conducted at least bi-annually
Number of courses evaluated on a periodic basis.
Results of evaluation activities

Goal: To provide state of the art facilities and systems to trained end users. (T&L, APC, IPI)

Objectives:

Ensure users are comfortable with equipment and training available.
Meet needs for increased computer, lab and classroom availability
Meet need for various language labs given potential student demographics
Upgrade the Library's computer system
Provide technology training program for new employees as part of orientation.
Provide Colleague training through Title V and from IT.
Provide support to Public Safety Department.
Provide Software systems support to all ECC administrative systems.

Measures:

Increase in number of classes conducted and attendance.
Decrease in number of security violations.
Decrease in user complaints and work-orders due to simple hardware or software problems.
Number of programs, agencies and facilities supported for hardware and software.

Goal: Provide Quality Information Services customer services to entire campus and co-located programs (IPI)

Objectives:

Provide proper IT staffing which is capable of meeting staff, faculty and student needs.
Survey to campus employees; evaluate IT staff's capability to provide support.
Provide up to date evaluation of current IT Support capabilities and requirements.

Measures:

Completed Surveys returned and assessed.
External IT Assessment completed and on-file
Prioritized personnel requested submitted to HR for annual budget.

Goal: Develop and support all educational, instructional, and training initiatives; and grants in providing outreach, access and training in information technology. (T&L, APC)

Objectives:

Ensure that full access is provided and that all customer service requests are handled in a timely and professional manner regardless of language.
Ensure training is provided that is universal and equitable for all students, faculty and staff regardless of initial training or educational level in technology.

Measures:

Number of customer services requests submitted requiring multi-lingual considerations.
Number of support services provided through multi-lingual capabilities.
Number of grants containing technology provision

Goal: Expand communications and information exchange processes to ensure understanding of IT standards, capabilities and procedures. (T&L, IPI)

Objectives:

Develop a software support subcommittee within ECC to establish software standards and support levels.
Develop a hardware support subcommittee within ECC to establish hardware standards and support levels.
Develop communication methodologies to disseminate standards and support level
Work with units to assure choices consistent with ECC major platforms.
Develop data standards subcommittee within ECC that is consistent with the overall campus client/server architecture.
Develop a standard request for proposal (RFP) process for systems purchases
Develop support plans and partnerships for all systems.
Maintain and enhance the advisory committee structure for information technology.
Solicit planning input from academic and administrative units.
Annually review and update plans.

Measures:

Establish a campus-wide software support task force.
Develop model for hardware and software standards.
Establish communication methodology; (i.e. Web page, newsletter, etc.)
Standards documented for ancillary systems.
Boilerplate section for RFPs developed for ancillary system purchases.
Standards are reviewed annually and updated as required.
Number of partnerships formed between IT and other units to support standards.
Effective representation of ECC community via advisory groups
Number of constituents participating in advisory groups

Goal: Provide end-users with current training and information on hardware and software capabilities, availability, and the life cycle replacement program. (IPI, Equity)

Objectives:

Development of centralized inventory systems for hardware and software
Plan funding sources or mechanisms
Establish necessary hardware replacement cycle.

Measures:

Establishment of centralized inventory system
Evaluation of hardware replacement needs and financial resources
Established replacement cycle at the campus level

Goal: Take advantage of every opportunity to learn and exchange information on new technology and concepts to meet customer's needs and expectations. (T&L, APC, IPI)

Objectives:

Maintain and enhance partnerships and participation in international, national and regional consortia for active development of instructional, research and technology opportunities.
Participate with state institutions in collaborative efforts for networking and telecommunications.
Collaborative efforts may include network management, outreach, and delivery, and enhance the relationship to include collaborative instructional development using technology.
Extend the Virtual ECC to include the creation of universal access statewide and enhance the relationship to include collaborative instructional development using technology.
Participate with State and local host locations on providing Internet connectivity and voice services.
Partner with communication vendors to provide services to ECC faculty, staff, and students

Measures:

Outcomes from collaborative relationships with external institutions or organizations
Outcomes from collaborative projects with external institutions or organizations
Outcomes from collaborative projects with other institutions within California

Measures:

Design structure for data warehouse
Establish data warehouse
Deploy data warehouse
Formal data administration is provided
Convert programs for reporting into data warehouse queries/reports
Data Dashboards are provided to each department tailored to their data needs.

Goal: Support the ongoing evolution of the educational environment to include use of and recognition of current and emerging technologies. (T&L, APC)

Objectives:

Identify and support faculty needs in developing technology-based courses by programs, workshops, consultation and development support offered by the Distance Education program.
Support programs and courses for technology-based delivery
Develop strategies and standards for creating effective learning environments using technology
Identify opportunities for improved technology support for research.

Measures:

Number of programs, workshops, consultation, and development services offered.
Number of faculty using the web for instruction
The number of web-based courses
Number of students enrolled in technology-delivered courses.

Goal: Continue to pursue campus infrastructure improvements through capital Equipment, grants and other funding sources to ensure cost-effective, flexible, maintainable, and reliable network infrastructure to support voice, video, virtual, and data needs. (IPI)

Objectives:

Maintain and enhance as necessary the existing copper cable plant.
Install category current code standard cable plant, as a minimum, in all buildings
Maintain and enhance as necessary the existing fiber optic cable plant. Continue to expand the fiber cable plant to all new construction sites
Extend Internet connectivity through the Ethernet network to all classrooms

Extend Internet connectivity through the Ethernet/Wireless network to all residence hall rooms
Maintain and enhance the ECC remote access services.
Create a Network Operations Center (NOC) to coordinate and monitor the deployment of the voice and data network statewide.
Provide enhanced systems for student-to-faculty voice communications at remote sites.
Provide enhanced systems for student-to-administration voice communications at remote sites.
Continue to improve media delivery systems
Maintain and enhance video and multimedia production and distribution infrastructure to meet national standards for distribution

Measures:

Percentage of standard Ethernet bandwidth within building networks
Number of classrooms with Internet connectivity
Number of residence hall rooms with Internet connectivity.
Blockage statistics for the modem pools.
Number of remote classrooms on the ECC data network
Number of remote locations on the ECC voice network
Circuits adequate to meet instructional and administrative needs statewide
Level of participation in development, production and distribution of instructional programming in international, national, regional and statewide venues

Goal: Develop professional development program to include skills catalog, training matrix, and targeted funding schemes to ensure the quality our human resources. (IPI, Equity)

Objectives:

Support campus diversity goals and enrich IT units through recruitment efforts.
Find and fund professional development opportunities for IT staff.
Ensure managers review with staff the progress units are making toward accomplishing their objectives at least quarterly.
Conduct evaluations for each manager to measure performance and assess development needs annually.

Measures:

Increased diversity among staff and managers
Number of staff and managers attending training sessions
Number of total training days attended by staff and managers
Completion of all staff and management evaluations on an annual basis
Vacancy rate for IT positions is zero.

Goal: Use information technology to enhance the library's accessibility, delivery, and timeliness of information services. (T&L, APC)

Objectives:

Increase support for periodical indexes on-line.

Increase Library's involvement in effective use of Internet and other electronic resources for locating and gathering information.

Use information technology to provide access to materials not owned by Library (e.g., interlibrary loans facilitated by electronic transfer of documents).

Measures:

Number of periodicals browsed both online and hard copy.

Number of searches on Library systems conducted by students

Number of customer service requests handled electronically against number handled by the LRC staff

Goal: Ensure student access to computing facilities and other learning resources. (T&L, APC)

Objectives:

Establish an overall plan for student access to computing and other learning resources through the use of mobile, global, and a variety of learning management systems (LMS).

Develop a funding model for providing the access needed by students, whether from on campus, home, or statewide sites

Monitor and measure progress in achieving the goals for student access.

Develop standards for hardware and software to increase accessibility and enable students with disabilities to utilize technologies

Provide adaptive technology stations for student access.

Measures:

Percent of students supported by converged technologies

Percent of students with e-mail accounts.

Number of networked computer stations in labs

Use of remote access facilities by remote users

Number of workstations equipped with applicable software and hardware for students with disabilities.

Goal: Optimize available resources through deliberate business process improvement review and research; and increase funding to provide innovative solutions for all IT related requirements. (IPI)

Objectives:

Establish and maintain data administration standards, protocols, and policies across the ECC community.

Promote standards for computer (desktop, mainframe, servers, and minis) and network (LAN and WAN) hardware, software, and operating systems

Maintain and build interfaces between major administrative systems and client applications to promote a seamless information environment for administrative functions at ECC.

Establish standard methodologies for project and application development, documentation, and maintenance of centralized systems.

Measures:

Standards, protocols and policies are documented and made available to the ECC community.
Standard methodologies identified and communicated to those maintaining the centralized systems.

Document incentives in place for taking advantage of ECC IT standards

Goal: Develop, maintain and enforce universal standards in terms of hardware, software, and network on all campus systems. (IPI)

Objectives:

Develop and publish standards for ECC and remote locations connectivity.

Develop and publish standards for network management and system monitoring and analysis.

Measures:

System for customers to report trouble and request services for the ECC network.

Standards developed and published for connecting all campus locations.

Standards developed and published for network management and system monitoring and analysis.

Goal: Provide innovative technological leadership in determining and optimizing the use of technology. (T&L, APC, IPI)

Objectives:

Research, evaluate, and promote use of state-of-the-art technology tools for data management, access, querying, and reporting.

Maintain currency on technology and management practices, capabilities and philosophies.

Participate in the ECC Master Planning Committee, College Technology Committee, as requested.

Support the ECC's budgeting process by submitting requested materials in accord with the ECC Finance and Budget Office policy and schedule.

Continuously gather IT-related data on an annual basis.

Report performance of IT units in the designated reports, and related accountability documents
Produce and distribute annual reports for each IT unit.
Provide formal status reports on all major projects to IT advisory committees.
Review all unit objectives annually.

Measures:

Demonstrations or seminars conducted.
Number of units assisted in determining proper technology acquisition.
Number of ECC wide presentations and/or meetings attended.
Completion of budget requests and/or documentation in a timely manner
Reports and/or presentations given on IT-related environmental changes
Results of performance measures shown in the Strategic Planning Goals Report.

Goal: Provide end-users of administrative systems and support systems quality and timely training and support. (EM, T&L, APC)

Objectives:

Prepare and develop administrative systems orientation to ensure end-users acquire working knowledge rapidly.
Define needed links/interfaces between administrative offices.
Include training as a key component in using administrative systems
Continue until complete our implementation of Colleague administration system
Minimize local modifications to vendor-supplied software.

Measures:

Research systems supported for engineering and implementation.
Report on local modifications needed for major administrative systems.
Complete implementation of all modules of Colleague
Implementation of upgrades of Colleague

Appendix A.

El Camino Community College District Technology Committee

Technology Committee: The Technology Committee serves as the consultation committee for campus-wide technology planning. The committee evaluates needs, strategizes solutions, and proposes recommendations for College technology. The committee develops, monitors and evaluates implementation of the College Technology Master Plan.

The Technology Committee, made up of a cross section of faculty and staff, meets regularly to discuss and evaluate all forms of technology on campus. The Committee brings forward technology needs and ideas from across the campus, and relays information to staff and faculty of changes taking place on campus. As the El Camino Community College District (ECC) has evolved, the Technology Committee has provided a wide spectrum of suggestions ranging from the use of technology in the classroom to the email system currently used by ECC.

COMMITTEE:

	Art Leible, Chair		Virginia Rapp Co-Chair		Dave Murphy Business Div.		Irene Graff Inst. Research & Planning
	Robert Sutton SRC		Melissa Guess Financial Aid		Mari Baquir SSVC		Howard Story Lib/Distance Ed.
	Steve Waterhouse Admissions & Rec.		Thomas Brown Facilities		Claudio Vilchis ITS/Network		Luis Mancia ECCE
	Andrei Yermakov Compton Center		Bill Mulrooney Admissions & Rec		Noreth Men Library		Idania Reyes Student Equity Programs
	Erick Mendoza Campus Police		Will Warren ITS/Applications		Andrea Sala Foundation		Dipte Patel Counseling & Student Success
	Lisa Mednick Prof. Development		Rebecca Russell Library Learning Resources		Maria Smith Human Res.		Ann Garten Public Info.
	Pete Marcoux Humanities		Thurman Brown Tech Services		Paul Yoder IT Security		Tiffany Ushijima ASO

“The Technology Committee serves as the consultation committee for campus-wide technology planning. The committee evaluates needs, strategizes solutions, and proposes recommendations for College technology. The committee develops, monitors and evaluates implementation of the College Information Technology Strategic Plan.”

Appendix B.

El Camino Community College District Information Security Improvement

School: Institutional Needs, Opportunities and Challenges

Institutional Needs to Support Information Technology

Information Security

Issue: As information security concerns begin to take center stage within the educational sector, the importance of creating a well-rounded and multi-layered InfoSec strategy has never been more urgent. Daily news headlines are filled with horror stories of Ransomware variants running wild and frequent breaches of sensitive Personally Identifiable Information (PII). As an example of the rapidly shifting tide of targeted sectors by the cyber-criminal community, in 2014 the healthcare sector wasn't even on the radar screen. The following year (2015), healthcare was at the top of the list. The consensus in the InfoSec community is that the same thing will happen in the educational sector. As more and more sensitive financial and personal data is sold on the black market (Dark Web), cyber-criminals are shifting their sights to more lucrative hunting grounds that offer an easy payday. Just as HIPAA data became a favored target almost overnight, so too will FERPA data. Unfortunately, FERPA data currently exists in a target-rich environment. Most educational institutions don't have a CISO (Chief Information Security Officer), and even if they have a formal information security program, it is likely to be in an immature state with few staff or tangible resources dedicated to the task. The following 5-step Security Awareness Roadmap (inspired by the SANS Institute) can help ECC to achieve that goal.

STEP 1: No Awareness Program – Year 0

This is the state where ECC was at previous to implementing the PLAN-NET study suggestions and hiring a dedicated full-time Information Systems Security Specialist. Although there were some security solutions deployed (firewalls, VPN, and end-point security), there was no cohesion between these disparate devices and no formal leadership as to how to best deploy and manage a formal security posture. Policies concerning proper use of the ECC computing environment were minimal, and no consideration was given to compliance standards such as PCI-DSS or NIST 800. There was also no vulnerability management capabilities or active penetration testing being performed in order to find and exploit weaknesses in the security fabric in order to harden systems and networks from being breached by sophisticated hacker techniques.

STEP 2: Compliance Focused – Year 1-2

This is the stage where ECC currently resides. A dedicated Information Systems Security Specialist is now on board and is working with the Administration, Systems, Network, and ITS Help Desk entities to develop a comprehensive information security program. Although in the early stages of discovery, careful consideration is being given to: creating an inventory of computing resources and implementing/hardening security on the perimeter, internal network, host (end-point), application, and data layers. The implementation of a PCI-DSS and/or FERPA

compliance program is implemented and third-party vendors that service the campus (and handle PII) are vetted for their adherence to these compliance standards.

STEP 3: Promotes Awareness & Change – Year 2

This is the stage where the InfoSec office will engage in a targeted Information Security Awareness and Education program that engages and trains the ECC community in responsible, ethical, and safe computing hygiene principals. Methods that may be employed during this stage can include anti-phishing campaigns, introduction of comprehensive Acceptable Use policies, and interactive training that encourages reinforcement of defensive computing habits (i.e. thinking before clicking). Other effective measures such as tracking repeat offenders and directing them to specific training modules can also be utilized. This is a very crucial step in the maturity of any information security program, because the #1 way to stop Ransomware and Malware infections is to properly train users on how to distinguish between valid emails & websites and fraudulent/suspect ones. An InfoSec internal webpage can also serve as a repository of useful tips and information and thus should be employed during this stage.

STEP 4: Long-Term Sustainment – Year 3

This is the stage where formal processes, procedures, resources, and training have been employed and are being reviewed at least once per year. Constant monitoring of the ECC computing environment is now a normal way of life and annual InfoSec training programs are part of the natural fabric of the institution. Also, there is frequent review of EOL (end of life) systems, and a vigilant forward-thinking approach to budgeting and planning for adoption of NextGen security solutions is now commonplace. All of the major stakeholders are now in sync – Administration, Systems, Network, ITS Help Desk, and InfoSec, and work together in a synergistic and holistic manner. This is a good time to invest in a CISO to formulate the direction of training and to begin regularly reporting progress to the Board regarding the steps in the next 2 stages. At this point, the hiring of additional InfoSec staff might be considered so that the CISO's efforts can become more targeted and focused.

STEP 5: Metrics Framework – Year 4-5

This is the stage where a robust metrics framework to track progress and measure impact is in place. As a result of this constant measurement of progress and impact of the InfoSec program, continuous improvement is being made and the program is able to demonstrate an ROI (Return On Investment). The InfoSec program has now reached full maturity. As the tried-and-true model is now in place, focused efforts can now be made as an outreach program to other educational institutions to help them achieve similar success in developing a comprehensive InfoSec program.

Glossary of Terms:

InfoSec: An acronym for Information Security.

Ransomware: A type of malicious software designed to block access to a computer system by locking and encrypting its files until a sum of money is paid. After the “ransom” has been paid,

the perpetrators are supposed to send an encryption key to the victim in order to unlock their files, although this doesn't always happen.

Malware: An acronym for "malicious software", malware refers to software programs designed to damage or do other unwanted actions on a computer systems.

Phishing: Phishing is similar to fishing in a lake, but instead of trying to capture fish, phishers attempt to steal your personal information. They send out e-mails that appear to come from legitimate websites such as eBay, PayPal, or other banking institutions. The e-mails state that your information needs to be updated or validated and ask that you enter your username and password, after clicking a link included in the e-mail.

PII: An acronym for "personally identifiable information", which includes personal data such as your name, address, social security number, credit card numbers, healthcare data, etc.

Dark Web: The "dark web" is the encrypted network that exists between Tor servers and their clients. Tor is the abbreviation for "The Onion Router" which is a domain where hackers and others exchange information and products for money. This is usually where stolen credit card data and other personal information is sold.

HIPAA: An acronym for the Health Insurance Portability and Accountability Act that was passed by Congress in 1996. It is a data security standard designed to protect the sensitive personal information of patients.

FERPA: An acronym for the Family Educational Rights and Privacy Act. FERPA is a Federal law that protects the privacy of student education records. The law applies to all schools that receive funds under an applicable program of the U.S. Department of Education.

CISO: An acronym for Chief Information Security Officer, generally is the head of any information security program who operates at the executive-level of an organization.

SANS: An acronym for the System Administration, Networking, and Security institute. SANS is the most trusted and by far the largest source for information security training and security certification in the world. It also develops, maintains, and makes available at no cost, the largest collection of research documents about various aspects of information security, and it operates the Internet's early warning system - the Internet Storm Center.

Firewall: A computer firewall limits the data that can pass through it and protects a networked server or client machine from damage by unauthorized users.

VPN: An acronym for "Virtual Private Network", a virtual private network is "tunneled" through a wide area network such as the internet. This means the network does not have to be located in one physical location like a local area network. However, by using encryption and other security measures, a VPN can scramble all the data sent through the wide area network, so the network is "virtually" private.

End-Point Security: Refers to the securing of the end-points in a local area network, such as PC's, printers, and any other locally networked devices.

NIST-800: A series of publications by the National Institute of Standards and Technology that recommends security controls for Federal information systems and organizations and documents security controls for all Federal information systems, except those designed for national security.

Vulnerability Management: The "cyclical practice of identifying, classifying, remediating, and mitigating vulnerabilities", especially in software and firmware. Vulnerability management is integral to computer security and network security.

Penetration Testing: Also called “pen testing”, is the practice of testing a computer system, network or web application to find vulnerabilities that an attacker could exploit.

Breach: A data breach is an incident in which sensitive, protected or confidential data has potentially been viewed, stolen or used by an individual unauthorized to do so. Data breaches may involve personal health information (PHI), personally identifiable information (PII), trade secrets or intellectual property.

Computing Hygiene: Computer hygiene refers to steps that computer users can take to improve their cyber security and better protect themselves online.

EOL Systems: An acronym for “End of Life” systems, where a piece of computer network hardware or software has ceased to be supported by the company that manufactured it.

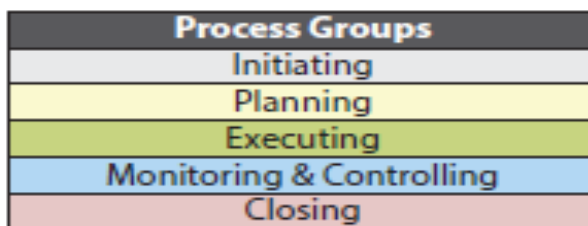
NextGen: An acronym for “Next Generation” of devices. Typically, these are devices (or software) that have taken the features of several separate devices and combined them into one device.

Appendix C.
Project Management Process Groups Details

The Technology Committee will follow a structured and rigorous process for prioritizing projects. As a result of this prioritization, projects approved by the committee will adhere to the following disciplined project management process. Throughout the course of project initiation through closure, reflections on progress and learning outcomes will be collected to ensure future project embed/reflect these learnings and become ECC's knowledge base as organization process assets (OPAs). The Technology Committee will follow the more universally accepted principals of the Project Management Institute, the organization that oversees the primarily accepted Project Management Certification standards, and creator of the Project Management Book of Knowledge which constitutes the primary handbook of all certificated Project Managers. These principles are shown in greater detail below.

- a. **Project Integration Management.** Processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.
- b. **Project Scope Management.** Processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully.
- c. **Project Time Management.** Processes required to manage the timely completion of the project.
- d. **Project Cost Management.** Processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs to ensure the project can be completed within the approved budget.
- e. **Project Quality Management.** Processes and activities of the performing organization that determine quality policies, objectives, and responsibilities to ensure the project will satisfy the needs for which it was undertaken.
- f. **Project Human Resource Management.** Processes that organize, manage, and lead the project team.
- g. **Project Communication Management.** Processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.
- h. **Project Risk Management.** Processes required for conducting risk management planning, identification analysis, response planning, and controlling risk on a project.
- i. **Project Procurement Management.** Processes necessary to purchase or acquire products, services, or results needed from outside the project team.
- j. **Project Stakeholder Management.** Processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

		Project Management Process Groups				
		Initiating	Planning	Executing	Monitoring & Controlling	Closing
Knowledge Areas	Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
	Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
	Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
	Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
	Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
	Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
	Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
	Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
	Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
	Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	



Project Integration Management. Processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.

4.0 Project Integration Management			
Process	Inputs	Tools & Techniques	Outputs
4.1 Develop Project Charter	<ul style="list-style-type: none"> • Project statement of work • Business case • Agreements • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Facilitation techniques 	<ul style="list-style-type: none"> • Project charter
4.2 Develop Project Management Plan	<ul style="list-style-type: none"> • Project charter • Outputs from other processes • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Facilitation techniques 	<ul style="list-style-type: none"> • Project management plan
4.3 Direct & Manage Project Work	<ul style="list-style-type: none"> • Project management plan • Approved change requests • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Project mgmt information system • Meetings 	<ul style="list-style-type: none"> • Deliverables • Work performance data • Change requests • Project mgmt plan updates • Project documents updates
4.4 Monitor & Control Project Work	<ul style="list-style-type: none"> • Project management plan • Schedule forecasts • Cost forecasts • Validated changes • Work performance information • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Analytical techniques • Project mgmt information system • Meetings 	<ul style="list-style-type: none"> • Change requests • Work performance reports • Project mgmt plan updates • Project documents updates
4.5 Perform Integrated Change Control	<ul style="list-style-type: none"> • Project management plan • Work performance reports • Change requests • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Meetings • Change control tools 	<ul style="list-style-type: none"> • Approved change requests • Change log • Project mgmt plan updates • Project documents updates
4.6 Close Project or Phase	<ul style="list-style-type: none"> • Project management plan • Accepted deliverables • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Analytical techniques • Meetings 	<ul style="list-style-type: none"> • Final product, service, or result transition • Org. process assets updates

Project Scope Management. Processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully.

5.0 Project Scope Management			
Process	Inputs	Tools & Techniques	Outputs
5.1 Plan Scope Management	<ul style="list-style-type: none"> • Project management plan • Project charter • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Meetings 	<ul style="list-style-type: none"> • Scope management plan • Requirements mgmt plan
5.2 Collect Requirements	<ul style="list-style-type: none"> • Scope management plan • Requirements mgmt plan • Stakeholder mgmt plan • Project charter • Stakeholder register 	<ul style="list-style-type: none"> • Interviews • Focus groups • Facilitated workshops • Group creativity techniques • Group decision-making techniques • Questionnaires and surveys • Observations • Prototypes • Benchmarking • Context diagrams • Document analysis 	<ul style="list-style-type: none"> • Requirements documentation • Requirements traceability matrix
5.3 Define Scope	<ul style="list-style-type: none"> • Scope management plan • Project charter • Requirements documentation • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Product analysis • Alternatives generation • Facilitated workshops 	<ul style="list-style-type: none"> • Project scope statement • Project documents updates
5.4 Create WBS	<ul style="list-style-type: none"> • Scope management plan • Project scope statement • Requirements documentation • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Decomposition • Expert judgment 	<ul style="list-style-type: none"> • Scope baseline • Project documents updates
5.5 Validate Scope	<ul style="list-style-type: none"> • Project management plan • Requirements documentation • Requirements traceability matrix • Verified deliverables • Work performance data 	<ul style="list-style-type: none"> • Inspection • Group decision-making techniques 	<ul style="list-style-type: none"> • Accepted deliverables • Change requests • Work performance information • Project documents updates
5.6 Control Scope	<ul style="list-style-type: none"> • Project management plan • Requirements documentation • Requirements traceability matrix • Work performance data • Organizational process assets 	<ul style="list-style-type: none"> • Variance analysis 	<ul style="list-style-type: none"> • Work performance information • Change requests • Project management plan updates • Project documents updates • Org. process assets updates

Project Time Management. Processes required to manage the timely completion of the project.

6.0 Project Time Management			
Process	Inputs	Tools & Techniques	Outputs
6.1 Plan Schedule Management	<ul style="list-style-type: none"> Project management plan Project charter Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Expert judgment Analytical techniques Meetings 	<ul style="list-style-type: none"> Schedule management plan
6.2 Define Activities	<ul style="list-style-type: none"> Schedule management plan Scope baseline Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Decomposition Rolling wave planning Expert judgment 	<ul style="list-style-type: none"> Activity list Activity attributes Milestone list
6.3 Sequence Activities	<ul style="list-style-type: none"> Schedule management plan Activity list Activity attributes Milestone list Project scope statement Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Precedence diagramming method (PDM) Dependency determination Leads and lags 	<ul style="list-style-type: none"> Project schedule network diagrams Project documents updates
6.4 Estimate Activity Resources	<ul style="list-style-type: none"> Schedule management plan Activity list Activity attributes Resource calendars Risk register Activity cost estimates Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Expert judgment Alternative analysis Published estimating data Bottom-up estimating Project management software 	<ul style="list-style-type: none"> Activity resource requirements Resource breakdown structure Project documents updates
6.5 Estimate Activity Durations	<ul style="list-style-type: none"> Schedule management plan Activity list Activity attributes Activity resource requirements Resource calendars Project scope statement Risk register Resource breakdown structure Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Expert judgment Analogous estimating Parametric estimating Three-point estimating Group decision-making techniques Reserve analysis 	<ul style="list-style-type: none"> Activity duration estimates Project documents updates
6.6 Develop Schedule	<ul style="list-style-type: none"> Schedule management plan Activity list Activity attributes Project schedule network diagrams Activity resource requirements Resource calendars Activity duration estimates Project scope statement Risk register Project staff assignments Resource breakdown structure Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Schedule network analysis Critical path method Critical chain method Resource optimization techniques Modeling techniques Leads and lags Schedule compression Scheduling tool 	<ul style="list-style-type: none"> Schedule baseline Project schedule Schedule data Project calendars Project mgmt plan updates Project documents updates
6.7 Control Schedule	<ul style="list-style-type: none"> Project management plan Project schedule Work performance data Project calendars Schedule data Organizational process assets 	<ul style="list-style-type: none"> Performance reviews Project management software Resource optimization techniques Modeling techniques Leads and lags Schedule compression Scheduling tool 	<ul style="list-style-type: none"> Work performance information Schedule forecasts Change requests Project mgmt plan updates Project documents updates Organizational process assets updates

Project Cost Management. Processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs to ensure the project can be completed within the approved budget

7.0 Project Cost Management			
Process	Inputs	Tools & Techniques	Outputs
7.1 Plan Cost Management	<ul style="list-style-type: none"> • Project management plan • Project charter • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Analytical techniques • Meetings 	<ul style="list-style-type: none"> • Cost management plan
7.2 Estimate Costs	<ul style="list-style-type: none"> • Cost management plan • Human resource mgmt plan • Scope baseline • Project schedule • Risk register • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Analogous estimating • Parametric estimating • Bottom-up estimating • Three-point estimating • Reserve analysis • Cost of quality • Project management software • Vendor bid analysis • Group decision-making techniques 	<ul style="list-style-type: none"> • Activity cost estimates • Basis of estimates • Project documents updates
7.3 Determine Budget	<ul style="list-style-type: none"> • Cost management plan • Scope baseline • Activity cost estimates • Basis of estimates • Project schedule • Resource calendars • Risk register • Agreements • Organizational process assets 	<ul style="list-style-type: none"> • Cost aggregation • Reserve analysis • Expert judgment • Historical relationships • Funding limit reconciliation 	<ul style="list-style-type: none"> • Cost baseline • Project funding requirements • Project documents updates
7.4 Control Costs	<ul style="list-style-type: none"> • Project management plan • Project funding requirements • Work performance data • Organizational process assets 	<ul style="list-style-type: none"> • Earned value management • Forecasting • To-complete performance index (TCPI) • Performance reviews • Project management software • Reserve analysis 	<ul style="list-style-type: none"> • Work performance information • Cost forecasts • Change requests • Project management plan updates • Project documents updates • Org. process assets updates

Project Quality Management. Processes and activities of the performing organization that determine quality policies, objectives, and responsibilities to ensure the project will satisfy the needs for which it was undertaken.

8.0 Project Quality Management			
Process	Inputs	Tools & Techniques	Outputs
8.1 Plan Quality Management	<ul style="list-style-type: none"> Project management plan Stakeholder register Risk register Requirements documentation Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Cost-benefit analysis Cost of quality Seven basic quality tools Benchmarking Design of experiments Statistical sampling Additional quality planning tools Meetings 	<ul style="list-style-type: none"> Quality management plan Process improvement plan Quality metrics Quality checklist Project documents updates
8.2 Perform Quality Assurance	<ul style="list-style-type: none"> Quality management plan Process improvement plan Quality metrics Quality control measurements Project documents 	<ul style="list-style-type: none"> Quality management and control tools Quality audits Process analysis 	<ul style="list-style-type: none"> Change requests Project management plan updates Project documents updates Org. process assets updates
8.3 Control Quality	<ul style="list-style-type: none"> Project management plan Quality metrics Quality checklists Work performance data Approved change requests Deliverables Project documents Organizational process assets 	<ul style="list-style-type: none"> Seven basic quality tools Statistical sampling Inspection Approved change requests review 	<ul style="list-style-type: none"> Quality control measurements Validated changes Verified deliverables Work performance information Change requests Project management plan updates Project documents updates Org. process assets updates

Project Human Resource Management. Processes that organize, manage, and lead the project team.

9.0 Project Human Resource Management			
Process	Inputs	Tools & Techniques	Outputs
9.1 Plan Human Resource Management	<ul style="list-style-type: none"> Project management plan Activity resource requirements Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Org charts & position descriptions Networking Organizational theory Expert judgment Meetings 	<ul style="list-style-type: none"> Human resources mgmt plan
9.2 Acquire Project Team	<ul style="list-style-type: none"> Human resource mgmt plan Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Pre-assignment Negotiation Acquisition Virtual teams Multi-criteria decision analysis 	<ul style="list-style-type: none"> Project staff assignments Resource calendars Project management plan updates
9.3 Develop Project Team	<ul style="list-style-type: none"> Human resource mgmt plan Project staff assignments Resource calendars 	<ul style="list-style-type: none"> Interpersonal skills Training Team-building activities Ground rules Colocation Recognition and rewards Personnel assessment tools 	<ul style="list-style-type: none"> Team performance assessments Ent. environmental factors updates
9.4 Manage Project Team	<ul style="list-style-type: none"> Human resource mgmt plan Project staff assignments Team performance assessments Issue log Work performance reports Organizational process assets 	<ul style="list-style-type: none"> Observation and conversation Project performance appraisals Conflict management Interpersonal skills 	<ul style="list-style-type: none"> Change requests Project management plan updates Project documents updates Ent environmental factors updates Org. process assets updates

Project Communication Management. Processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.

10.0 Project Communications Management			
Process	Inputs	Tools & Techniques	Outputs
10.1 Plan Communications Management	<ul style="list-style-type: none"> Project management plan Stakeholder register Ent environmental factors Organizational process assets 	<ul style="list-style-type: none"> Comm. requirements analysis Communication technology Communication models Communication methods Meetings 	<ul style="list-style-type: none"> Communications mgmt plan Project documents updates
10.2 Manage Communications	<ul style="list-style-type: none"> Communications mgmt plan Work performance reports Ent environmental factors Organizational process assets 	<ul style="list-style-type: none"> Communication technology Communication models Communication methods Information mgmt systems Performance reporting 	<ul style="list-style-type: none"> Project communications Project management plan updates Project documents updates Org. process assets updates
10.3 Control Communications	<ul style="list-style-type: none"> Project management plan Project communications Issue log Work performance data Organizational process assets 	<ul style="list-style-type: none"> Information mgmt systems Expert judgment Meetings 	<ul style="list-style-type: none"> Work performance information Change requests Project management plan updates Project document updates Org. process assets updates

Project Risk Management. Processes required for conducting risk management planning, identification analysis, response planning, and controlling risk on a project.

11.0 Project Risk Management			
Process	Inputs	Tools & Techniques	Outputs
11.1 Plan Risk Management	<ul style="list-style-type: none"> Project management plan Project charter Stakeholder register Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Analytical techniques Expert judgment Meetings 	<ul style="list-style-type: none"> Risk management plan
11.2 Identify Risks	<ul style="list-style-type: none"> Risk management plan Cost management plan Schedule management plan Quality management plan Human resources mgmt plan Scope baseline Activity cost estimates Activity duration estimates Stakeholder register Project documents Procurement documents Enterprise environmental factors Organizational process assets 	<ul style="list-style-type: none"> Documentation reviews Information gathering techniques Checklist analysis Assumptions analysis Diagramming techniques SWOT analysis Expert judgment 	<ul style="list-style-type: none"> Risk register

Project Procurement Management. Processes necessary to purchase or acquire products, services, or results needed from outside the project team.

12.0 Project Procurement Management			
Process	Inputs	Tools & Techniques	Outputs
12.1 Plan Procurement Management	<ul style="list-style-type: none"> • Project management plan • Requirements documentation • Risk register • Activity resource requirements • Project schedule • Activity cost estimates • Stakeholder register • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Make-or-buy analysis • Expert judgment • Market research • Meetings 	<ul style="list-style-type: none"> • Procurement management plan • Procurement statement of work • Procurement documents • Source selection criteria • Make-or-buy decisions • Change requests • Project documents updates
12.2 Conduct Procurements	<ul style="list-style-type: none"> • Procurement mgmt plan • Procurement documents • Source selection criteria • Seller proposals • Project documents • Make-or-buy decisions • Procurement statement of work • Organizational process assets 	<ul style="list-style-type: none"> • Bidder conferences • Proposal evaluation techniques • Independent estimates • Expert judgment • Advertising • Analytical techniques • Procurement negotiations 	<ul style="list-style-type: none"> • Selected sellers • Agreements • Resource calendars • Change requests • Project management plan updates • Project documents updates
12.3 Control Procurements	<ul style="list-style-type: none"> • Project management plan • Procurement documents • Agreements • Approved change requests • Work performance reports • Work performance data 	<ul style="list-style-type: none"> • Contract change control system • Procurement performance reviews • Inspections and audits • Performance reporting • Payment systems • Claims administration • Records management system 	<ul style="list-style-type: none"> • Work performance information • Change requests • Project management plan updates • Project documents updates • Org. process assets updates
12.4 Close Procurements	<ul style="list-style-type: none"> • Project management plan • Procurement documents 	<ul style="list-style-type: none"> • Procurement audits • Procurement negotiations • Records management system 	<ul style="list-style-type: none"> • Closed procurements • Org. process assets updates

Project Stakeholder Management. Processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution

13.0 Project Stakeholder Management			
Process	Inputs	Tools & Techniques	Outputs
13.1 Identify Stakeholders	<ul style="list-style-type: none"> • Project charter • Procurement documents • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Stakeholder analysis • Expert judgment • Meetings 	<ul style="list-style-type: none"> • Stakeholder register
13.2 Plan Stakeholder Management	<ul style="list-style-type: none"> • Project management plan • Stakeholder register • Enterprise environmental factors • Organizational process assets 	<ul style="list-style-type: none"> • Expert judgment • Meetings • Analytical techniques 	<ul style="list-style-type: none"> • Stakeholder management plan • Project documents updates
13.3 Manage Stakeholder Engagement	<ul style="list-style-type: none"> • Stakeholder management plan • Communications mgmt plan • Change log • Organizational process assets 	<ul style="list-style-type: none"> • Communication methods • Interpersonal skills • Management skills 	<ul style="list-style-type: none"> • Issue log • Change requests • Project management plan updates • Project documents updates • Organizational process assets updates
13.4 Control Stakeholder Engagement	<ul style="list-style-type: none"> • Project management plan • Issue log • Work performance data • Project documents 	<ul style="list-style-type: none"> • Information management systems • Expert judgment • Meetings 	<ul style="list-style-type: none"> • Work performance information • Change requests • Project management plan updates • Project documents updates • Organizational process assets updates

Appendix D: Top Issues Facing Technology in Higher Education

As part of development of the Technology Plan, the ECC Technology Committee reviewed the current information technology (IT) landscape in higher education to determine the most critical issues to address or support at El Camino College. These issues generally fit into three broad categories:

- **The College:** Institutional needs, opportunities, and challenges
- **Classrooms:** Faculty pedagogy and professional development
- **Students:** Tracking and supporting student learning and success

Several resources were used to identify these issues, including EDUCAUSE, Horizon Report Technology Outlooks (Horizon Report), The Campus Computing Project (TCCP), the Society for College and University Planning (SCUP), the El Camino Community College District IT Assessment (PlanNet Report), and the ECC Technology Survey (full references below).

The topics of greatest interest or need were determined through a discussion and voting process by members of the Technology Committee. The top issues identified by the committee are discussed below, categorized according to their scope and placed in order of priority.

College: Institutional needs, opportunities, and challenges

12. Information Security
13. Institutional Data Management
14. Information Technology (IT) Funding Models
15. IT Workforce Hiring and Retention
16. IT Organizational Development
17. Americans with Disabilities Act (ADA) Compliance
18. Online Forms and Processes
19. Enterprise Application Integrations
20. Business Intelligence and Analytics
21. Data Standards and Data Exchange
22. Mobilization

Classroom: Faculty pedagogy and professional development

6. Faculty and Online Education
7. Educational Technologies
8. Digital Literacy (faculty and staff)
9. Shift to Deeper Learning Approaches
10. Open Educational Resources (OER)

Student: Tracking and supporting student learning and success

4. Student Success Technologies
5. Measurement of Learning
6. Digital Literacy (students)

The College: Institutional Needs, Opportunities and Challenges

1. Information Security

Information security tops the list of major IT concerns in higher education. Colleges frequently experience threats to their information and systems security. In response, institutions need to develop a comprehensive and nimble approach to information security to address the changing landscape. Appendix B provides additional details on the issues that must be addressed in a holistic response plan (Grajek, 2016; SCUP, 2015; 2016).

2. Institutional Data Management

As the number of ways data is used and the number of users rapidly expands, the need for managing the data becomes increasingly mission critical. Institutional stakeholders must agree upon how data is defined, used, stored, secured, and shared through development of data standards and thoughtful governance (Grajek, 2016).

3. Information Technology Funding Models

Adequate funding of the Information Technology (IT) function is a long-standing issue, warranting an annual place among EDUCAUSE's *Top 10 IT Issues* since the list's inception (Grajek, 2016). IT has undergone dramatic changes in higher education, but supportive funding models have not kept pace, resulting in lagging lifecycle replacement and inadequate agility to respond to external changes or instructional innovations. According to the 2016 *NMC Horizon Report for Higher Education*, many institutions "are narrowing their focus to what they perceive as the minimal subset of enterprise services they can afford to sustain. As a result, educators are often trying to design new, innovative learning models that must be integrated with outdated, pre-existing technology and learning management systems" (Johnson, et al., 2016).

4. IT Workforce Hiring and Retention

High staff turnover and mismatched skillsets are common across higher education, as institutions compete with industry for similar IT positions (Grajek, 2016; Green, 2015). Similarly, adequate user support is among the top priorities among Chief Information Officers (CIOs) (Green, 2015). Many consider IT training for both faculty and students to be in need of improvement (see *Digital Literacy* below).

5. IT Organizational Development

The Information Technology function supports both daily operations as well as innovations in teaching and learning. An adequate, reliable, and cost-effective IT organization is critical to both student success

and efficient institutional function. However, rapid change in the field requires an IT organization to plan for change in required workforce skillsets and ensure that IT resources align with institutional directions (Grajek, 2016). According to EDUCAUSE's Susan Grajek (2016), "the IT organization needs to have a plan to optimize the allocation of human resources in order to maximize the productivity of the individual, the team, the IT organization, and the institution." Consideration of IT organizational development should include its organization and structure at the institution, how individuals manage their careers and skills, and how the institution supports these activities. A related priority assessed by EDUCAUSE is "Change Management" – increasing the IT organization's capacity for managing change, despite differing institutional needs, priorities, and abilities.

6. Accessibility and ADA Compliance

According to an agreement between the U.S. Department of Education's Office for Civil Rights (OCR) and a community college system, "*Accessible* means a person with a disability is afforded the opportunity to acquire the same information, engage in the same interactions, and enjoy the same services as a person without a disability in an equally effective and equally integrated manner, with substantially equivalent ease of use. The person with a disability must be able to obtain the information as fully, equally and independently as a person without a disability. Although this might not result in identical ease of use compared to that of persons without disabilities, it still must ensure equal opportunity to the educational benefits and opportunities afforded by the technology and equal treatment in the use of such technology" (U.S. Department of Education Office of Civil Rights, 2013). All colleges must review the modes of delivery of instruction, services, and information to ensure compliance and equitable access for their students.

7. Electronic Workflow and Forms Processes

The El Camino Community College District has many administrative processes that still rely on printed, triplicate forms and hand- or papermail delivery. According to findings in the PlanNet IT Assessment conducted in 2015, "Many departments are clamoring for electronic workflow and forms processing capabilities, which are part of most enterprise class document management platforms" (PlanNet Consulting, 2015). Electronic workflow ranked low in satisfaction but high in importance among staff assessed for the PlanNet report, resulting in an alignment valuation of "poor."

8. Enterprise Application Integrations

Recent changes in the dynamics of the conversation about the value of higher education have caused more institutions to focus on improving integrated computing services provided to all students and employees to reduce barriers to student and faculty success (Grajek, 2016). Today, virtually all computing systems and services provided by institutions to constituents are delivered through, or are supported by, enterprise-wide integrated campus networks, Internet, security, and academic and administrative computing applications. These include not only those traditionally thought of as part of the overall integrated administrative and academic systems solution, but also the entire range of supporting applications, services, mobile, classroom audio visual, assistive/adaptive learning,

research/analytic, and multimedia systems that rely on data from the main overall computing systems and database applications or that provide and exchange data and information in return.

9. Business Intelligence & Analytics

According to Grajek (2016), Business Intelligence (BI) “utilizes methods and technologies that collect, store, report, and analyze...data to help [institutions] make business decisions.” Business Intelligence tools and approaches typically allow for the display and transformation of data into useful information for analysis and decision-making. Effective development and utilization of BI tools was a top issue for EDUCAUSE (Grajek, 2016). Institutions have an increasing need to be more data driven and responsive to changing external needs. BI expands the number of constituents viewing and working with data to support trend analysis. BI systems can also support “what if” scenarios and predictive modeling, which can help anticipate needs and support more timely institutional responses.

10. Data Standards and Data Exchange

The State of California has made a number of attempts to develop intersegmental data systems to track students from Pre-Kindergarten to higher education and even to employment. Such systems can measure outcomes beyond the institution to identify roadblocks or successful endeavors. State and federal reporting requirements also promote the need for such systems. However, these systems, such as CalPASS+ and Launchboard, are only as good as the data quality and consistent reporting of each institution. Data standards, such as consistent data entry and extract guidelines and data sources for reporting are essential to ensure data validity and reliability in intersegmental systems. On the horizon is direct data exchange, which removes the need for extracts and reporting—systems could speak directly to each other to ensure complete data reporting and usage. For example, the California Community Colleges (CCC) Technology Center is partnering with other entities on the EdExchange, “an open standards-based way to securely exchange real-time data—such as electronic transcripts—between academic institutions and their service providers” (Souza, 2016). Complete, accurate data and consistent participation will assure that institutions can maximize the potential of such systems.

11. Mobilization

Mobilization refers to the shift toward relying on hand-helds and other mobile devices for a wider variety of daily activities, including administrative and academic activities in higher education. The *Technology Outlook for Community, Technical, and Junior Colleges 2013-2018* recognized mobilization as both an opportunity and a challenge for community colleges (Johnson, et al., 2013). While mobile devices provide innovative opportunities for educational delivery, competence with these devices and with specific apps is becoming a critical job skill in some professions. Higher education institutions will need to adjust to a more “mobile” world and respond to how students are utilizing their mobile devices. In addition, community colleges will need to ensure that the latest mobile skillsets required for jobs are incorporated into curriculum.

Classrooms: Professional Development and Modernization of Learning Environments

1. Faculty and Online Education

Online education, or distance education, has increasingly become a learning environment of choice for college students. Almost half of the student population nationwide has reported taking an online course in the past year (Grajek, 2016). The Babson Survey Research Group's 2014 Survey of Online Learning found a nearly 4% increase in the number of higher education students taking at least one online course since the previous year. The rising popularity of online education can be attributed to students' familiarity with the online environment, as they spend much of their time on the Internet and social networks for learning and exchanging new information. Flexibility with respect to the timing and location of learning is also considered a primary reason to take online courses (Grajek, 2016).

According to Johnson, et al. (2013; 2016), online learning has features unique to its environment, which include opportunities for increased collaboration that extend beyond the classroom while equipping students with stronger digital skills. Institutions can readily adopt "hybrid" learning models that integrate both online and face-to-face learning to optimize the benefits of both environments. Given the increase in students' participation in online courses, paired with the benefits of online learning, 71% of chief academic leaders perceive online education to be critical to their institution's long-term strategy (SCUP, 2015). There are, however, certain factors that need to be taken into consideration. For example, while more than half of academic leaders agree that online learning is critical, only 28% reported that faculty embrace the "value and legitimacy of online education" (SCUP, 2015). Academic leaders have also increasingly expressed concerns about the retention of online students, particularly among minority and adult learners (Grajek, 2016). This points to the need for careful planning around providing both faculty and students the support they need to ensure successful and quality online teaching and learning.

2. Educational Technologies

Educational technology is constantly undergoing changes, upgrades and innovations. Despite the variety of educational technologies, there are commonalities in the ways that they can foster student learning and instruction. For one, a growing range in technologies that are available and affordable brings greater potential for learning to become more personalized for students based on their learning styles and personalities (Johnson, et al., 2013). For example, students have their own preference for certain devices, such as iPhone or Android. Interacting with more comfortable tools to learn and perform in classrooms, combined with greater accessibility of certain technologies (e.g., affordable handheld devices), can lead to greater individual comfort and productivity in student learning (Johnson, et al., 2013). Secondly, the range in educational technologies can provide numerous opportunities for teachers to assess and document student learning (Johnson, et al., 2013; SCUP, 2016). For example, analytics data allows instructors to track students' participation and progress in online learning. According to Johnson,

et al. (2013), dashboards help filter information such that instructors can monitor students in real time. This can facilitate their understanding of how and to what degree their students are engaging with the content at hand. This, in turn, helps them evaluate and determine how their instruction can be adapted to better support the students. E-portfolios have also become increasingly used by higher education institutions to help students demonstrate their educational progress (SCUP, 2016). This has not only provided legislators and other stakeholders in education with useful evidence of student outcomes, but has helped employers determine what experiences and knowledge their applicants bring. Together, educational technologies can play an important role in improving students' learning experience and providing educators with rich data about student learning that can inform future instruction.

Optimizing educational technology, however, brings important challenges (Grajek, 2016). It requires thoughtful inquiry into what educational issues certain educational technology addresses, along with the different challenges and opportunities different types of educational psychology bring for both students and teachers. It also calls for a careful assessment of *how much* technology in the classrooms is appropriate based on an understanding of the students' and faculty's experiences, knowledge, and needs. Similarly, each institution must understand how teachers perceive certain educational technology to be beneficial for their students and to what degree they are rewarded for successful teaching, service, support and teamwork. This requires greater collaborative efforts between faculty and academic leadership in helping one another understand and support the use of technology in teaching and learning. Understanding and supporting faculty's role in integrating educational technology into their classrooms is evidently critical; higher education CIOs ranked "[assisting] faculty [to] integrate IT into instruction" as one of their top priorities over the next two to three years (Green, 2015).

3. Digital Literacy

Digital literacy, defined as "ensuring that faculty, staff, and students are informed about, and have the skills to make the most effective use of new IT services, technologies, and applications" (Grajek, 2016), was among the top 15 issues in higher education IT. Although digital literacy is considered to be a critical issue, professional development for faculty designed to help them develop and use digital literacy skills across their curricula has been lagging nationwide (Johnson, et al., 2013). There has slowly been a growing recognition of the need for such professional development, but this is has not been the norm. According to Johnson, et al. (2013; 2016), factors that contribute to the lack of professional development in digital literacy include faculty's lack of time and expectations for these learning opportunities, along with their concerns about working with new technologies, which are rooted in the fear that the focus will shift from learning to the novelty of using new tools or devices. Therefore, more effective professional development would help educators experience a positive shift in their attitudes about adopting a meaningful pedagogy built on integrating technology. It would help them explore firsthand new and various technologies. More importantly, there is a need for a greater cultural shift

within the institution focused on helping faculty and students develop and use digital literacy both inside and outside of the classrooms (Johnson, et al., 2013; 2016).

4. Shift to Deeper Learning Approaches

Deeper learning approaches, defined by the William and Flora Hewlett Foundation as the mastery of content that engages students in critical thinking, problem-solving, collaboration and self-directed learning, has also been of growing importance for higher education (Johnson, et al., 2016). Students' ability to make connections between what they learn in the classrooms and the real world, along with their understanding of how their newly developed knowledge and skills can impact them outside of the classroom, is a critical motivational factor in the quality of students' classroom engagement and learning. There are various methods that have been shown to help students actively make their connections, such as project-based learning, challenge-based learning, and inquiry-based learning. These student-centered methods encourage higher levels of student autonomy in their learning – for example, by asking students to brainstorm and implement solutions to global issues critical to their communities. Johnson, et al. (2016) argue that technologies can enhance these methods by helping students relate classroom materials and assignments to real life contexts and applications. This can have implications for professional development opportunities. These opportunities can help educators discover how various tools can support deeper learning approaches and professional development can also support implementation efforts.

5. Open Educational Resources (OER)

The high cost of textbooks in higher education has been a long-term concern and can serve as an effective barrier to college access if not covered by financial aid. In response, initiatives are building to promote free or affordable textbooks and other educational materials for college courses (SCUP, 2016). In fact, according to Johnson, et al. (2013), advocates of open educational resources are pursuing a broad definition of “open” to include materials that are freely copiable, sharable, and mixable for educational purposes. The Horizon report further states that, “as authoritative sources lose their importance, there is need for more curation and other forms of validation to generate meaning in information and media” (Johnson, et al., 2013).

Philanthropies and legislators are also supporting OER initiatives. The State of California has made strides toward the promotion and adoption of OER in higher education. In 2012, all three public higher education systems in California were directed by the legislature to create an online library with high quality, affordable, or free educational resources and textbooks. The College Textbook Affordability Act (Assembly Bill 798) of 2015 further promoted this goal through a grant program to support individual college textbook affordability programs.

In terms of faculty interest and participation, TCCP's *Going Digital* survey of instructors found that 15% of college faculty now use OER in their courses, while 75% reported knowing little or nothing about the subject (Green, 2016). However, over 70% of faculty cited high quality of materials and lower cost for students as important considerations for adopting OER.

Students: Tracking Student Learning and Success

1. Student Success Technologies

EDUCAUSE defines student success technologies as those that “involve the use of data collection and analysis tools at all levels to predict student success or risk, alert those who can intervene, and assess the effectiveness of those interventions. Student success technologies can be broken into three categories: (1) tools that support advising and other student services, (2) tools that support teaching and learning, and (3) tools that inform curricular design and institutional priorities” (Grajek, 2016). Student success systems and tools leverage technology to improve student success, an endeavor ranked as a top priority for higher education CIOs over the next two to three years (Green, 2015). However, such technologies may not be effective without proper development and implementation. As of the 2015 survey, only 27% reported that the investments in analytics were “very effective.” Adoption of these approaches to monitoring and supporting student success should be accompanied by rigorous assessment to determine how these tools are utilized and how well they accomplish their intended goals. The Campus Computing Project survey results found that only 21% of CIOs assess technology impacts on instructional outcomes (Green, 2015).

2. Growing Focus on Measuring Learning

As measurement of learning integrates into standard instructional practice, a wider variety of methods are being applied by faculty to evaluate student learning progress and skill acquisition. In addition, more digital systems are available to collect, store, and report measures of learning. Institutions could leverage existing systems or explore possibilities to integrate assessment of learning into course management systems, for example, and to promote learning analytics and visualization to support data interpretation and instructional improvements (Johnson, et al., 2016).

3. Digital Literacy for Students

As noted above, lagging digital literacy remains a top issue in higher education. Insufficient digital literacy is an issue for students as well as faculty and other college employees. In a fall 2012 campuswide survey, between 24% and 54% of respondents felt less than comfortable performing a range of common digital tasks, from conducting research on the Internet to installing software, or uploading and downloading files (Institutional Research & Planning, 2013). In addition, only 41% of students felt comfortable seeking technical support. These findings suggest that even “digital natives”

would benefit from software and other training to ensure they are comfortable performing standard tasks that support academic success and build life skills.

Johnson, et al. (2014) reminds the Horizon report readers that some students may be disadvantaged in the digital environment based on socioeconomic circumstances and related reduced exposure to computers, software, and applications. However, a Fall 2016 survey of entering students found that 97% reported owning a desktop or laptop, up from 94% in Fall 2012. In addition, 94% owned at least one smartphone in 2016. This suggests a more nuanced perspective on the “digital divide” (unequal access to technological resources). Where, in the past, institutions needed to be concerned about whether students had a computer and Internet access, today, institutions may need to determine the technologies or devices students are using to consume and participate in educational content. For example, Johnson, et al. (2013) noted that “educational content does not necessarily render properly on all mobile devices.” Their report goes on to state, that “on the other hand, many technologies are providing opportunities for personalization. Adaptive programs and self-paced online courses all contribute to an environment in which learners from all over the globe can be challenged at the appropriate level; it is just a matter of educators guiding them through these types of resources so they can better direct their learning and understand what tools they need to stay on track.”

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