SEPTEMBER 13, 2017

CAL POLY
Information Technology Services

02-114 CLASSROOM UPGRADE

PROPOSAL FOR UPGRADING 02-114 INTO AN ACTIVE LEARNING CLASSROOM

ITS CLASSROOM TECHNOLOGY SUPPORT
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CONTRIBUTORS

Several people on the Cal Poly ITS / CTS team have assisted in providing, collecting and editing the data and information in this document, and this page recognizes and thanks them for their invaluable contributions.

CAL POLY
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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Information Technology Services has consulted with the Educational Department to provide a plan to ***upgrade the technology in the conference room in 02-114 at a rough estimated cost of 115K end-to-end. The estimated schedule from project approval to finish is about 6 months*** (which includes bidding time, and the timeline initiates when the facilities team is available to start). There are some items that the presented cost does not include, mainly carpeting, and asbestos abatement (if needed). The technology upgrade proposal is being done to complement teaching methods and improve the intelligibility, visibility, collaborative capabilities, personalization, and support of the space. The room is typically host to graduate studies programs where the seating capacity does not need to be as high as a typical under graduate classroom, so to accommodate an active learning setup, the seating has been design for 21 people (including the instructor). This classroom is being designed to be a flagship classroom for the Education department that provides the modern technology to complement active learning and matches the "Learn By Doing" Ethos of Cal Poly.

The ***next steps are to validate the funding, initiate facilities project requests, and develop the bid specifications utilizing this document as the baseline to move forward. Every step of the process will have stakeholder engagement (the Education team, ITS, Facilities)*** discuss the details and ensure everything specified meets the needs of the team. This is ultimately an iterative process to meet the needs of all stakeholders to get to the right design for the space. Look at this document as a starting point as a discussion of costs, schedule, usage, and how it can complement a variety of teaching modalities. After the budget and elements of the project are agreed upon, we will move into formal bid documentation design and creating the technical drawings needed to go with the bid. We will host meetings as we move into each phase of the project to ensure we are updating everyone on the schedule and ensure the vision of the project remains consistent.

REQUIREMENTS

WHY CHANGE IS NECESSARY?

The upgrade is necessary for several reasons: to replace out of warranty equipment and failing equipment along with improving the presentation capabilities of the space and introducing the capability of using multiple teaching modalities in the space that would be complemented by technology. Supporting new spaces with new components must also be rapid and seamless, so the ability to monitor the state of components and remotely make adjustments will allow faculty to continue teaching with minimal downtime.

CHALLENGES

- The smaller size of the room to accommodate enough space for technology and ADA space requirements and maintain a decent seating space.
- The hard-lid ceiling complicates installation of recessed hardware in the ceiling (ceiling speakers, motorized projection screen) due asbestos concerns.
- Maintaining an adequate seating capacity when using the space in an Active Learning format
- Securing/Storage of mobile equipment

MUST HAVES

- Design for mobile furniture and an active learning space
- Wall mounted speakers to enhance and focus audio
- Addition of mobile displays to help increase collaboration capabilities
- Additional whiteboard space
- Equipment with robust warranty repair and replacement service
- Reduce hardware complexity where possible to minimize failure points
- Provide for remote monitoring and support of classroom technologies
- Consistent, reliable, and proven track record of low failure rates

NICE TO HAVES

- LED Colored lighting to create TED-Talk like experiences
- 360 Camera for Virtual Reality – based conferences
- Scheduling Panel outside of room to display room schedule
- Motorized shades to reduce light and improve image contrast

WANT TO AVOID

- Purchasing non-standard hardware solely for cost reasons that limit our ability for central monitoring and support
- Excessive wall and ceiling penetration to minimize asbestos and lead disturbance (by using more Wiremold, surface mount raceway, for cabling to devices in the room).

SYSTEM DESCRIPTION

DESIGN NOTES

Classroom 02-114 proposed designed has been based around the active learning teaching modality, and the design supports standard presentation-based lectures as well if the furniture is re-arranged appropriately. Historically, technology-based active learning spaces have been tethered by cables, limiting the mobility and flexibility of a space. The design presented in this document tries to minimize the number of cables that would normally tether a desk in place by providing as many mobile, wireless solutions as feasible.

Based on a 2017 study showcased in the International Journal of Teaching and Learning in Higher Education, it has been shown that graduate students' satisfaction in their courses increased in active learning classrooms, but the costs can be generally prohibitive to widely scale technology-complemented active learning spaces.[1] Classrooms designed around active learning promote student success, and at its core, promotes the Cal Poly standard of Learn by Doing. Implementing active learning spaces one space at a time may be the only financially feasible way outside of major capital development projects to start bringing this classroom design to life at Cal Poly. Many studies have shown that students in fully vetted active learning classrooms with the appropriate lesson plans in place, conducive to that modality of teaching, have been more successful in learning and understanding the materials they are being presented, with the classic example being that of the Harvard Physics professor, Eric Mazur.

TECHNOLOGY NOTES

Another item of note is that the bulbs of bulb-based projectors contain Mercury, a known toxin for both humans and the environment, so the proposed design eliminates projector bulbs. Laser projectors will eliminate this particular waste product from being continuously introduced into the environment. The laser projectors also output less noise and uses less power, so they will be a great fit for the classroom.

[1] Hyun, J., Ediger, R., & Lee, D. (2017). Students' Satisfaction on Their Learning Process in Active Learning and Traditional Classrooms. *International Journal Of Teaching And Learning In Higher Education*, *29*(1), 108-118.

EQUIPMENT OVERVIEW

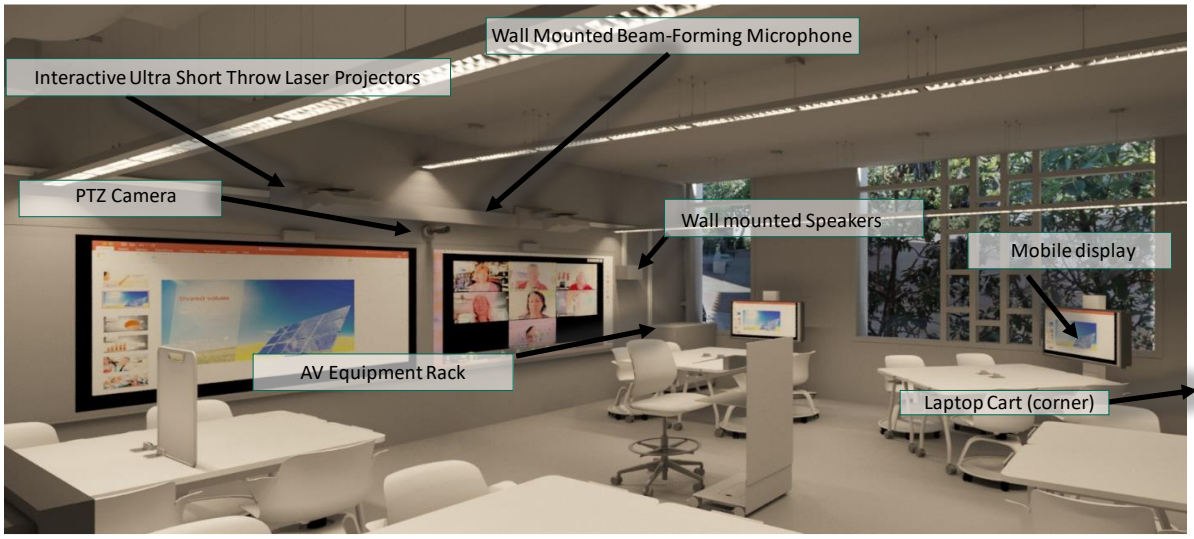

Figure 1. Visible System Components

USE CASES

USE CASE 1: COLLABORATION, ACTIVE LEARNING

When using the Active Learning modality, students can be broken out into five tables, each of the portable displays get assigned to the table groups. The table layout shown in figure two is optimized for ADA and space requirements. Users can connect to their display wirelessly via the Mersive Solstice Pods or the instructor can broadcast their device to all displays. The room is controlled via an IPad which is wall mounted or via the podium PC (where an app is available to control video and audio in the room). When everyone is finished collaborating, they can share their work on all the displays using the Solstice's collaboration mode, or by manually switching via the touch panel. Students can have their work shown on the front two projection screens (which double as whiteboards for the space).

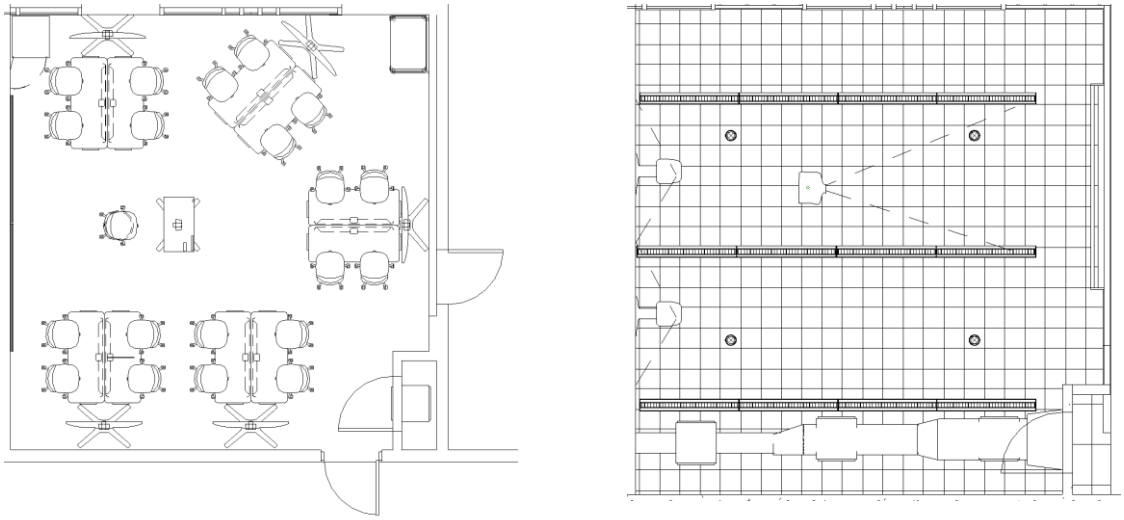

Figure 2. Floor Plan for active learning setup with Reflected Ceiling Plan

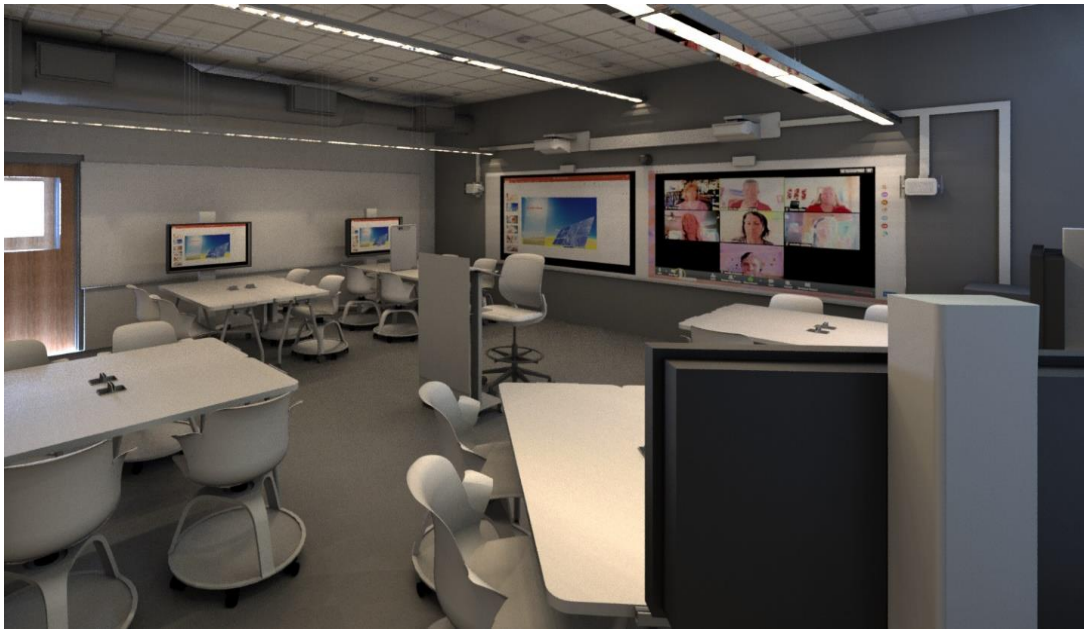

Figure 3 Rendered image of active learning setup

USE CASE 2: TESTING

Similar to the existing layout of the classroom today, the furniture is laid out against the walls in the room, while the mobile displays sit in the center of the room with the podium. The displays can be used to convey testing information or timers. The fifth display is stored against the east wall. Using the Steelcase Verb tables with the mini-whiteboards, dividers can be created between each testing station.

The test moderator sits in the center of the room next to the mobile displays, and all the laptops can be pulled from the laptop charging cart in the northeast corner of the room. After the testing is completed the moderator or the test taker can return the laptop to the charging cart.

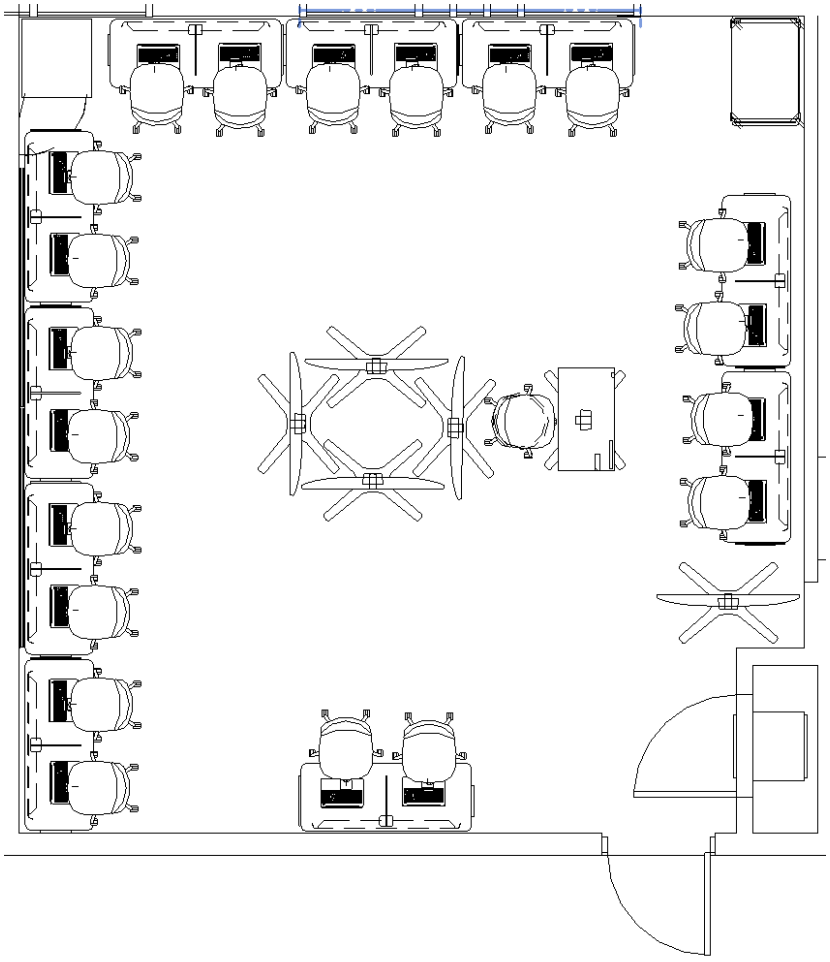

Figure 4. Room testing layout

OTHER COMPONENTS

- Audio system should last 10 years which includes the speakers and audio processor.
- Projection screen, 12 years, depending on how well maintained it is and general wear and tear.
- The computers should be upgraded after 4 years (Apple and Mac)
- All other electronics that are connected to the network should be viable for 4 to 5 years, unless a security flaw is exposed and the manufacturer no longer supports the component
- Mounting Hardware should last 15 years, and be replaced if mounted equipment exceeds the mounts specifications or it shows signs of stress or damage.

INFRASTRUCTURE CONSIDERATIONS

POWER

The Room will need some outlets relocated or added to ensure all standards are met. Specifically, at the wall a duplex AC outlet must be installed for each of the two short throw laser projectors. Since audio is being transmitted digitally at the rack, the project can utilize an individual branch circuit rated at 15 amps near the rack, and a separate 15 Amp branch circuit for the three projectors. A 20 Amp rated outlet is recommended for the laptop charging cart. Using wiremold as raceway for cabling for power, data, and A/V to all devices is acceptable.

NETWORKING

The room has sufficient data drops, but one set of drops (3) may be needed by the AV rack. The AV rack will house a network switch to both power some devices and to communicate to some devices. The network switch is a requirement for the AV rack and is budgeted for as part of the equipment for the project. Coordination will be needed with the network team to reserve IP addresses for the components in the room.

PROJECT MANAGEMENT OVERVIEW

PROJECT NEED

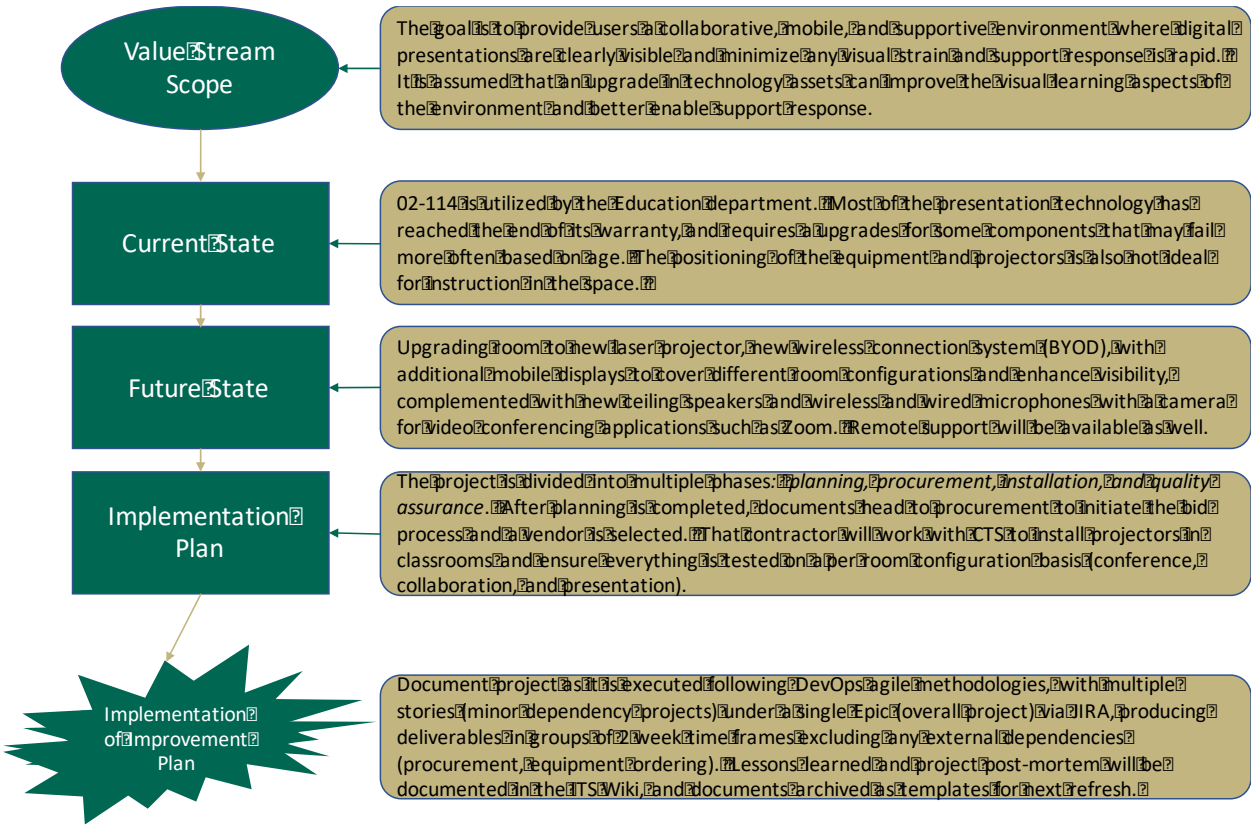

Figure 6 Kaizen Value Stream Mapping Summary of project

PEOPLE & RESOURCES (INTERNAL)

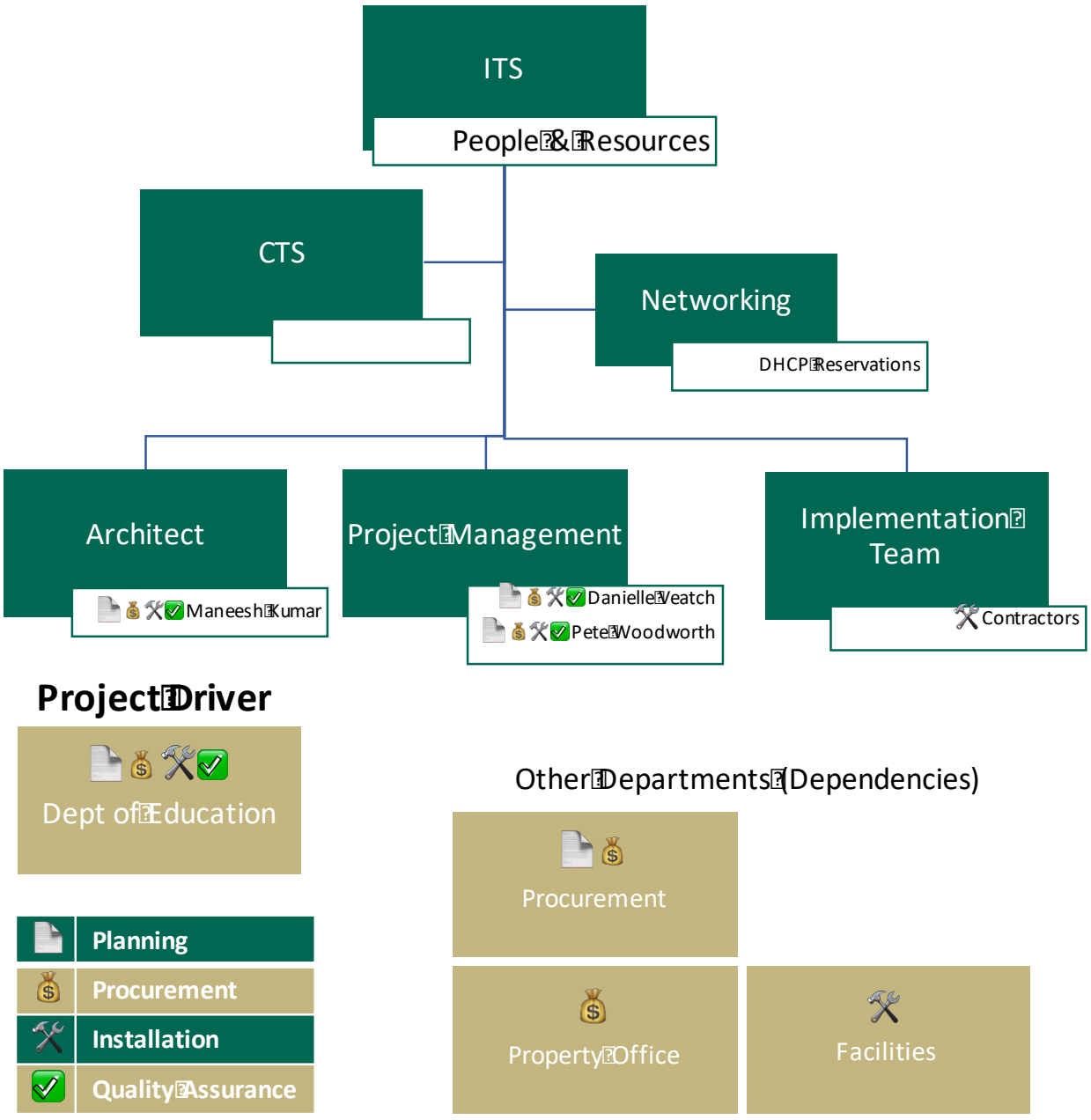

Figure 7 Project Resources

RACI CHART

ID	Task	Collaborative Space Architect, Manesh Kumar	CTS Project Manager	ENS Team (Networking)	Education Department	Procurement / Purchasing	Facilities	Property Office	AV Contractor	Reseller
1	System Concept	R	I	C	A				I	
2	Design Documents	R	C	I	C	I	I		I	
3	Bid Documentation	R	I	C	C	A			I	I
4	Permits		I	I	A	I	I	R		
5	Execution Timeline	C	R	I	C	I	I		A	A
6	Budget	I	I		A	I	I		A	
7	Quality Assurance	C	R		I				A	
8	Commissioning	C	A		I				R	
9	Training	C	R		I				A	
10	Project Approval	I	I	I	R	I	I		C	
11	Site Access		I		R		I		A	
12	Installation	C	I	I	I		I		R	
13	Configuration	C	I	I	I				R	
14	Programming	C	I		I			R	R	
15	Change Management	C	A	I	R	I	C		R	

R Responsibl C Consulted
A Accountab I Informed

02-114 Upgrade

Table 1 RACI Chart – Project Communication Hub

WORK BREAKDOWN STRUCTURE

Figure 8 Work Breakdown Structure, depicts project lifecycle, Level 1 is the overall project

ESTIMATED SCHEDULE

Approvals	Bid Documents	Bid	Equipment Orc	Startup	Install	Verification	Punch List	Post-Mortem
20	14	90	**30**	**1**	**10**	2	5	1
							Contingency 5%	8.65
							Total Days	181.65

Table 1 Schedule Estimate in days (end-to-end for project), excluding delays due to trade workloads

TECHNOLOGY BUDGET

The presented estimated costs should be taken as a rough-order-of-magnitude cost, but it will be sufficient to generate an accurate budget estimate for the project. It should be noted that only technology and estimated labor costs are included, not furniture or other ancillary costs.

ESTIMATED LABOR COSTS

Laborers	Materials	Hours	Hourly Rate	Prevailing Wage	Total Range
2 (Installers)	$1500	40	$120.00	$45.49	11,100
1 (Programmer)	$0	20	$100	N/A	$2,000

Onsite Trades (7% Fee and 10% Contingency)	1000	16	50	N/A	$1800
Networking	300	8	$50	N/A	$700

Table 2 Labor Cost Estimate (Low value is the baseline California prevailing wage rate for comm. workers)

EQUIPMENT COST ESTIMATE

ID	Type	Description	Brand	Model	Cost	Qty	Unit	Total
1	AV Switcher Frame	10 x 8 Switcher w/ Processor	Extron	DTP CrossPoint 108 4K	9500	1	EA	9500
2	AV Switcher	4x1 HDMI to DTP	Extron	DTP T SW4 HD 4K	800	1	EA	800
3	AV Transmitter	AV HDMI to DTP Transmitter	Extron	DTP HDMI 4K 230 Tx	320	2	EA	640
4	AV Receiver	2-Gang Digital AV Output	Extron	XTP R HWP 201 4K 60-1629-23	1000	2	EA	2000
5	Interactive Display	49" UHD Commercial Display	LG	LG UV340C-Series 49	900	5	EA	4500
6	Projection White Board	Dalite Idea Panaoramic 192 x	Dalite	Idea Panoramic 27970T	2500	1	EA	2500
7	Wireless Control	RS-232 to 802.11 Wireless	GlobalCache	WiFi to Serial WF2SL	115	5	EA	575
8	Projector	Short Throw Interactive Laser Projector	Epson	Brightlink 1470UI	5000	2	EA	10000
9	BYOD Appliance	Wireless BYOD Hardware for Windows/IOS/Android	Mersive	Solstice Pod Unlimited	1300	6	EA	7800
10	PDU	Nework Switched/Managed 8 Outlet PDU	Crestron	PC-300	900	1	EA	900
11	ODU	Nework Switched/Managed 16 Outlet PDU	Digital Loggers	Power Switch Pro Rack	350	1	EA	350
12	Network Switch	24 Port POE+ Network Switch	Alcatel-Lucent	OS	600	1	EA	600
13	AV Control Processor	AV Control Appliance	Extron	IPCP Pro 555 w/Link License 60-1434-01A	3250	1	EA	3250
14	AV Control Interface	AV Touch panel control with App	Apple	IPAD	550	1	EA	550
15	AC Control Interface Mount	Ipad locking dock	iRoom	iDock for iPad	1100	1	EA	1100
16	Display Stand	Motorized Stand	Chief	Fusion Mobile Mount Medium	650	5	EA	3250
17	UPS	Display Mounted UPS	Juice Goose	SL 350	350	5	EA	1750
18	Charging Cart	Laptop Charging Cart	Aver	Avercharge S42i+	1700	1	EA	1700
19	Audio Processor	Audio DSP	Biamp	TesiraForte AI DAN	2500	1	EA	2500
20	Speaker	Wall Mounted POE/Dante Enabled Speaker	Monacor	WALL-05DT	600	2	EA	1200
21	AV Rack	AV Equipment Rack	Middle Atlantic	PTRK22	800	1	EA	800
22	Wireless Tx	Wireless AV HDMI Tx	Extron	eLink 100 T	350	5	EA	1750
23	Wireless Rx	Wireless AV HDMI Rx	Extron	eLink 100 R	350	5	EA	1750
24	Windows PC	Dell Std PC	Dell	Dell Micro	950	1	EA	950
25	Apple Machine	Mac Mini	Apple	Mac Mini	550	1	EA	550
26	Media Player	Blu-Ray Player	Tascam	BD-10U	300	1	EA	300
27	KVM	USB KVM	AdderView	ADDERView 4 PRO DisplayPort or Alternative	500	1	EA	500
28	Microphone	USB Wall Mount Beam Forming Microphone Array	Nureva	HDL3000	2800	1	EA	2800
29	Furniture	10 Desks, 20 Mini-Whiteboards, Podium, Whiteboard Rails	Steelcase	Verb Series	21000	1	Set	21000
30	Keyboard / Mouse	Wireless Keyboard Mouse	Logitech		40	1	EA	40
31	Camera	USB Camera, PTZ	Logitech	Lifesize Hardware	1000	1	EA	1000

SubTotal	86,905.00
Labor	15,600.00
Taxes	6,952.40
Contingency 5%	4,345.25
Shipping	869.05
Total	114,671.70

Table 3 Total Estimated Costs for upgrading 02-114

ADDITIONAL COSTS

Facilities will charge for any time that is required for a project. The following items will be part of the tasks needed to be performed by the Facilities department and in-house trades:

- Installation of studs and drywall on east wall, along with painting the wall
- The purchase and installation of any additional whiteboards for the room
- Installation of carpeting is recommended to help improve acoustics and aesthetics.
- Removal of corkboard is recommended, replace with whiteboard or top to bottom painted-on whiteboard on south wall
- Other Costs that will need to be considered include the cost of mobile devices (laptops) for the laptop charging cart that are dedicated to the room.

APPENDIX

PROJECT DOCUMENTATION

The documents that will be created for this project are as follows:

- Step 1
  - Client Discussion Minutes
  - 002-114 Technology Upgrade Program Document (This document)
- Step 2
  - 002-114 Technology Upgrade Data Analysis Spreadsheet (Excel)
- Step 3
  - 002-114 Technology Upgrade Project Implementation Plan
- Step 4
  - 002-114 Technology Upgrade Equipment Bid Specifications
  - 002-114 Technology Upgrade Installation Bid Specifications

SPECIAL COMPONENTS

IPAD AND DOCK

BRING YOUR OWN DEVICE (BYOD) APPLICANCE

Figure 12 Mersive Solstice Pod, BYOD Hardware Appliance

The Mersive Solstice Pod is designed for classrooms and allows for most mobile devices to be displayed on a projector or monitor. An unlimited number of users (limited by network bandwidth) can connect their device to the unit by downloading an app or navigating to the URL of the box shown on the displays. From there, a moderator can showcase, zoom and arrange everyone's devices, wirelessly.

features	solstice by mersive	airmedia	airtame	clickshare	wepresent
max # of users sharing content	unlimited	4	1	4	4
max media that can be shown on-screen	unlimited	4	1	4	4
user control of layout	✓	✗	✗	✗	✗
customizable layouts	✓	✗	✗	✗	✗
moderator ability to filter media	✓	✗	✗	✗	✗
dynamic session access control	✓	✗	✗	✗	✗

POWER MANAGEMENT

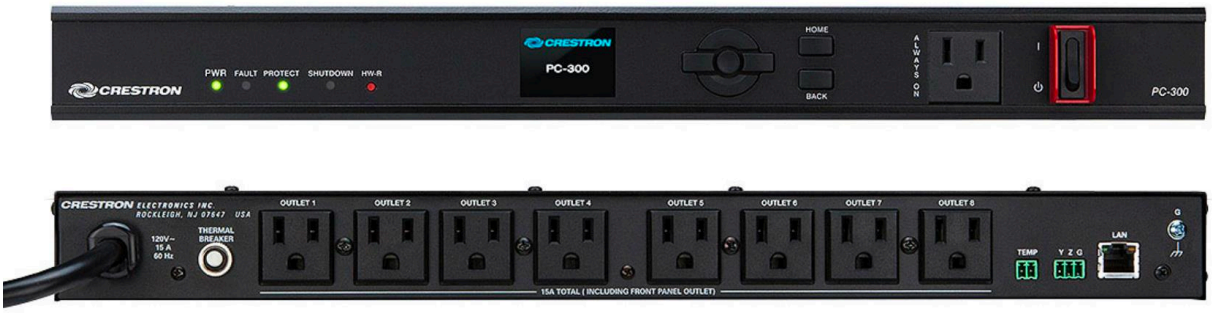

Figure 44 Crestron PC-300 Network switched and managed power distribution unit (PDU)

Energy Conservation is always important, and the ability to monitor and track power usage can help make future purchasing decisions. The Crestron PC-300 power distribution unit is a network switched, rack mounted power conditioner and controller. If hardware isn't responding, it can automatically power cycle hardware or it can be remotely reset when configured on the network. It also includes an external temperature sensor that can be mounted to the interior of the equipment rack, to monitor and send alerts when conditions get too hot.