Facility Conditions
A System Dynamics Review of the CSU Capital Outlay Program and its Impacts to the CSU, Chico Campus

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Abstract

The California State University, Chico's assets are deteriorating. The existing mechanisms to improve the campus through the California State University (CSU) Capital Outlay program will do little to address the widespread degradation of the campus facilities. Through delegated authority, each campus is responsible for the welfare of its facilities; creating 23 separate approaches to facilities management and enabling a zero sum game for capital resources. The consequences of widespread facilities degradation is impacting student success and preventing both the system and individual campuses from focusing on its core responsibilities and ultimately its mission. While the CSU system appears to be aware of the theory of asset management and total cost of ownership, policies and practices indicate that there is a large gap between comprehension and implementation. This paper will analyze the existing CSU facilities management system utilizing two dynamic models to understand general system behavior, local impacts to the CSU, Chico campus and potential leverage points for improvement.

Key Words
Facilities Management, Government Policy, Fixes that Fail

Introduction

The California State University, Chico has a wide array of facilities, all of which are slowly decaying. Without the proper allocation of resources, facilities that were once assets become detrimental liabilities. Operations and maintenance staff become a triage unit focusing primarily on reactive work which further increases the rate of deterioration of the facilities. Failing systems impact budgets, shifting precious resources into a pseudo risk pool. The investment in triaging a problem provides little return, as more often than not the fix only provides temporary relief to return the facility to service and does not address the true deficiency (Committee on Advanced Maintenance Concepts for Buildings 1990). The problem is not isolated to the California State University, Chico campus, but rather is magnified here due to the advanced age of the University. Almost all campuses within the California State University (CSU) system are experiencing similar problems ("Major Capital Outlay Programs: 2005-2014" 2012). This past January, Fresno State, which is one of the California State University campuses, lost the ability to provide power to the majority of its campus for three days due to failures in its electrical infrastructure (Armbruster 2013). From a system dynamics perspective, the problem is a classic example of a "fixes that fail" model (Senge 2006), as there is continued deterioration of facilities with minor improvements that occur periodically when funding is provided through the Major Capital Outlay Program.

The overall problem appears to be quite simple; resource investment is less than that which is needed to maintain the physical assets at an acceptable level. Two dynamic models were created; one to understand the resource allocation of the CSU Capital Outlay Program and the other focusing on how this resource distribution impacts the deferred maintenance and facility conditions of the CSU, Chico campus. Ancillary impacts to campus operations are explored to provide further insight into potential long term risks and the persistent erosion of the level of service.

California State University, Chico

The California State University, Chico was founded in 1887 as a normal school. The campus is the second oldest in the CSU system. From a facilities standpoint, 70% of the campus is older than 30 years. The majority of the campus, over 50% of its physical space, was built between the 1950's and 1970's ("CSU, Chico Facilities Lifecycle Data" 2012). While age alone cannot be used to ascertain the state of facilities, it can help to indicate the expected state of the facilities. Most, if not all, of these facilities were designed by the California State Architect as utilitarian concrete structures congruent with the modernist movement of the era. This era of design was mainly focused on creating space, with neither foresight for energy consumption nor flexibility for future changes (Bernstein 2004). Additionally, building materials of this era contained three known hazardous materials, asbestos; lead, and polychlorinated biphenyls (PCBs).

Today, the CSU, Chico campus is comprised of approximately 36 state general fund supported facilities of which 24 directly serve the primary function of the educational mission of the campus. Below is a summary of the 2012 campus facilities conditions ("CSU, Chico Facilities Lifecycle Data" 2012).

The summary metrics used in the table are common to the field of facilities management and provide a broad synopsis of the quantity and conditions of the University's facilities. The key metric is the Facility Condition Index (FCI), as it defines the percentage of aged building systems in comparison to the total value of the facility. FCI greater than 0.10 is considered to be poor (Rush 1991) within the collegial facilities management industry.

Table 1 – CSU Chico Facilities Conditions

CSU Chico	Gross Space (sqft)	Current Replacement Value (CRV) ($)	Deferred Maintenance (DM) ($)	Facility Condition Index (FCI)
Primary Facilities	1,717,685	$ 532,533,614	$ 140,573,185	0.26
Support Facilities	310,856	$ 29,585,376	$ 4,974,029	0.17
Total Facilities	**2,028,541**	**$ 562,118,991**	**$ 145,547,214**	**0.26**

The California State University Capital Outlay Program

The California State University system operates a formal Capital Outlay Program to identify all of the future needs of the 23 campuses. This yearly Capital Outlay Program identifies the campus need for both State and "non-State" funded projects ("Major Capital Outlay Programs: 2005-2014" 2012). The focus on this study is "State" funded projects which covers the majority of academic and support facilities supported by the General Fund of the State of California. The following is directly from the 2013/2014 Capital Outlay Program:

> ***Basis of the Capital Outlay Program***
> *"The primary objective of the Capital Outlay Program for the California State University (CSU) is to provide facilities appropriate to the CSU's approved educational programs, to create environments conducive to learning, and to ensure that the quality and quantity of facilities at the 23 campuses serve the students equally well."*
>
> *The Capital Outlay Program and the Five-Year Capital Improvement Program (state funded) have the following basis:*
>
> 1. *Approved Academic Master Plans*
> 2. *Approved Campus Physical Master Plans*
> 3. *Full-Time Equivalent Student Enrollment Allocations*
> 4. *Approved Space and Utilization Standards*

5. *Space and Facilities Database*
6. *Phasing Out of Leased and Temporary Facilities*
7. *Estimates of Cost Based on the ENR California Construction Cost Index*
8. *Utility Conservation and Alternate Financing for Efficiency Improvement Projects*
9. *Seismic Policy and Program*
10. *Sustainable Building Practices*

Each campus has the responsibility of identifying their individual priorities and must follow standardized planning rules. The general criteria and/or requirements that shape the list are:

- Each campus may submit a maximum of one project for the first two years, three projects for the next three years.
    - The exception to this rule is that Seismic Retrofits are excluded from the limit and are prioritized according to recommendations from the CSU Seismic Review Board.
- "Priorities will be determined based upon the strategic needs of the system in consideration of existing deficiencies in the type, amount and/or condition of campus space to serve the academic master plan."
- If more than one large auditorium or lecture hall is proposed, priority will be given to the project which 50% or more of its funding is from non-state sources.

Detailed project requests are provided by the campus for review at the Chancellor's Office. Once approved, the information presented in the Capital Outlay program with a summary of the key statistics which were utilized in analyzing the project need, please see Appendix C for further details.

After each campus submits their yearly outlay plan, the department of Capital Planning, Design and Construction at the Chancellor's Office constructs a "State Funded Capital Outlay Program Priority List" for the system. This list identifies the system wide priorities and communicates the CSU need to the California State Government. In reviewing both the current Outlay request and historical data, the adjacent information can be gleaned.

2013/2014 Priority List	$520.611M
2013/2014 Program	$6.339 B
Historical Avg Priority List	$540.0M
Historical Avg Actual Funding	$249.155M

Table II

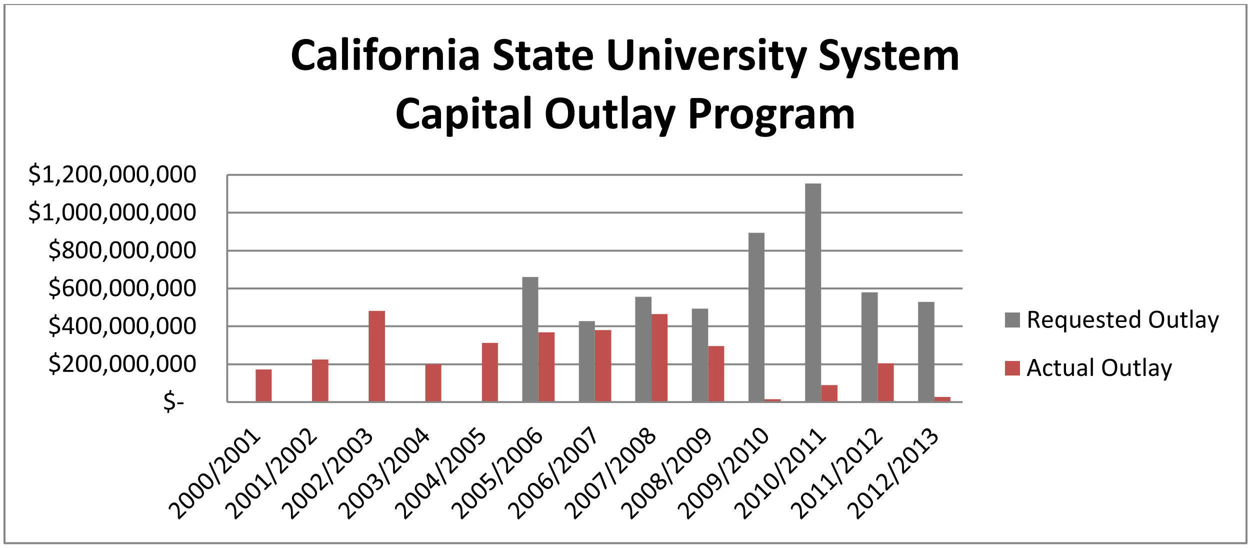


*Figure I - *Requested Outlay Data not available for 2000-2005*

Facility Lifecycle – Theoretical View

Total Project Costs	
+Operating Costs	(O&M)
+Capital Renewal	(CR)
+Deferred Maintenance	(DM)
+Decommissioning	
Total Cost of Ownership	

Facilities are an asset to the organization and must be managed as such. To fully exploit and utilize an asset, most organizations analyze the total cost of ownership and budget accordingly. For an individual facility, the total cost of ownership is essentially all costs necessary to build, use, modify, extend and eliminate the facility (Donald 2006). Within the CSU system, the Capital Outlay Program identifies funds for Total Project Costs and Decommissioning. Through CSU Executive Order 847, the Chancellor's Office has delegated authority and responsibility to the campus to

> "…ensure that appropriate resources are directed toward meeting the requirement of proper operations and maintenance of the campus physical plant. The responsibility includes the maintenance (routine, scheduled, deferred) and capital renewal of facilities, utility infrastructure, roads and grounds, which allow the university to meet its educational mission (Reed January 10, 2003)."

A great deal of debate and research has been expended to determine appropriate deferred maintenance guidelines to ascertain the expected costs to the organization. Individual facilities are comprised of numerous systems and subsystems all of which have independent lifecycles (Kaiser 2009). APPA, formerly known as the Association of Physical Plant Administrators, is one of the industry leaders in defining lifecycle standards. Additionally, APPA has published many articles and books detailing the common higher educational problem of deteriorating facilities, with the seminal book <u>The Decaying American Campus, A Ticking Time Bomb</u> published in 1989. Many campuses across the United States experienced what was perceived as a rapid state of decay in the late 1980's and early 1990's, with CSU, Chico (Chico State at the time) being included within this group. The roots of this phenomenon could be traced to the higher education system's exponential growth rates of the 1950's and 1960's which satisfied the demand of the baby boomer generation.

The CSU system has elected to utilize the FRRM lifecycle model, which utilizes slightly different lifecycles than what APPA stipulates. When a system's lifecycle has expired and the system is still in use, it's considered to be in a state of deference and is identified as deferred maintenance. Utilizing FRRM standards for a facility with CRV of $20M, approximately $12M (~55%) worth of building systems are identified as replaceable. For example, a few items that are not considered replaceable are foundations, structural framing, etc. In reviewing the lifecycle curve absent any reinvestment, it's apparent that facilities are expected to be in a dilapidated state after thirty years with little to no capital renewal investment.

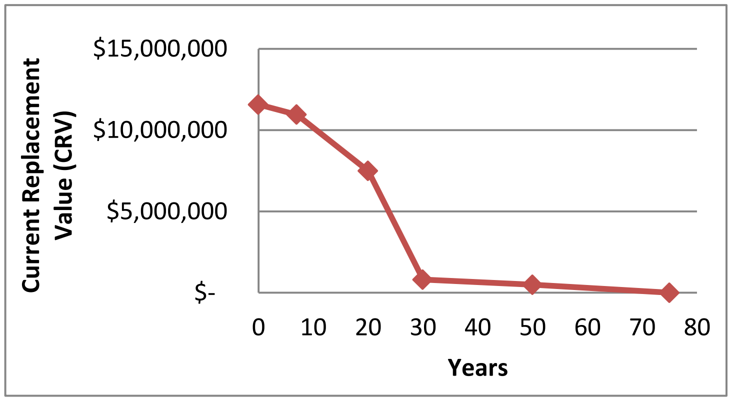


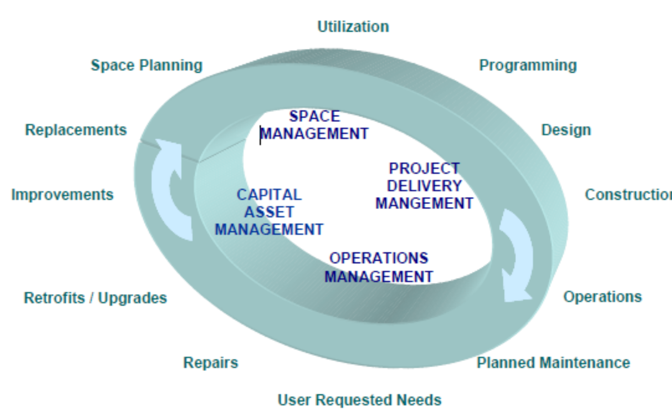
Figure II - Replaceable Systems Lifecycle Curve

Facility Lifecycle - The Reality

While the lifecycle curve exists, in an environment of limited resources, only either the truly critical systems or cosmetic features are reinvested in. From a facilities systems maintenance standpoint, there are only a few systems that are deemed critical. Replacement of roofs, re-caulking of windows and paint happen to be the three most prevalent reinvestments across all facilities according to colleagues within the Facilities Management & Services Department at CSU, Chico. As of late, the campus has reinvested heavily in replacing lighting systems, as a replacement of t-12 lamps with t-8 lamps will generate an approximate three year payback. Part of the rationale for this new investment is the shared savings of all "energy" projects.

As Lyneis and Sterman (2009) identified, management will not make significant investments unless positive feedback is received through resource reinvestment From an adoption curve standpoint, the campus is in the laggard category, as sister CSU campuses have made the transition to t-8s years ago for both financial and regulatory reasons; as the U.S. Department of Energy has mandated that t-12's can no longer be produced after January 1, 2013.

Image I – Facilities Asset Model (APPA)



The campus is comprised of 36 state funded facilities, all at varying stages in their lifecycle. Operating a preventative maintenance program becomes a lower priority in comparison to triaging system failures. The dynamics of this problem have been well researched, with multiple articles on the subject by Sterman, Repenning, Jambekar, Thun and others. In summary, with limited maintenance hours available and the combination of both a large stock of defective systems and pressures to immediately correct the problem, preventative maintenance is ignored, creating a negative reinforcing loop as maintenance funds are diverted to immediate needs. Lyneis and Sterman (2009) provided a detailed study of this exact problem within a University's maintenance operation. Their findings show that overall:

1. Budget pressures have turned maintenance departments into "cost centers", not "Investment Opportunities."
   i. Because maintenance staff do such a good job of band-aiding problems, leadership continues to underestimate the severity of the maintenance backlog problem.
2. A tipping point must be reached for Preventative Maintenance to be a worthwhile investment, otherwise it simply adds to the costs.

Overall, the Facilities Management system within the CSU system is quite complex, with many competing areas of need. While Executive Order 847 is clear that campuses are responsible for maintaining their facilities, few actually maintain them adequately, passing the deficiencies on to future generations. In reaction to this reality, the Chancellor's Office has historically made "Minor Capital", "Capital Renewal" and "Infrastructure" requests ("Major Capital Outlay Programs: 2005-2014" 2012). Unfortunately, these requests further perpetuate the problem, as it communicates two important unspoken truths to the 23 campuses:

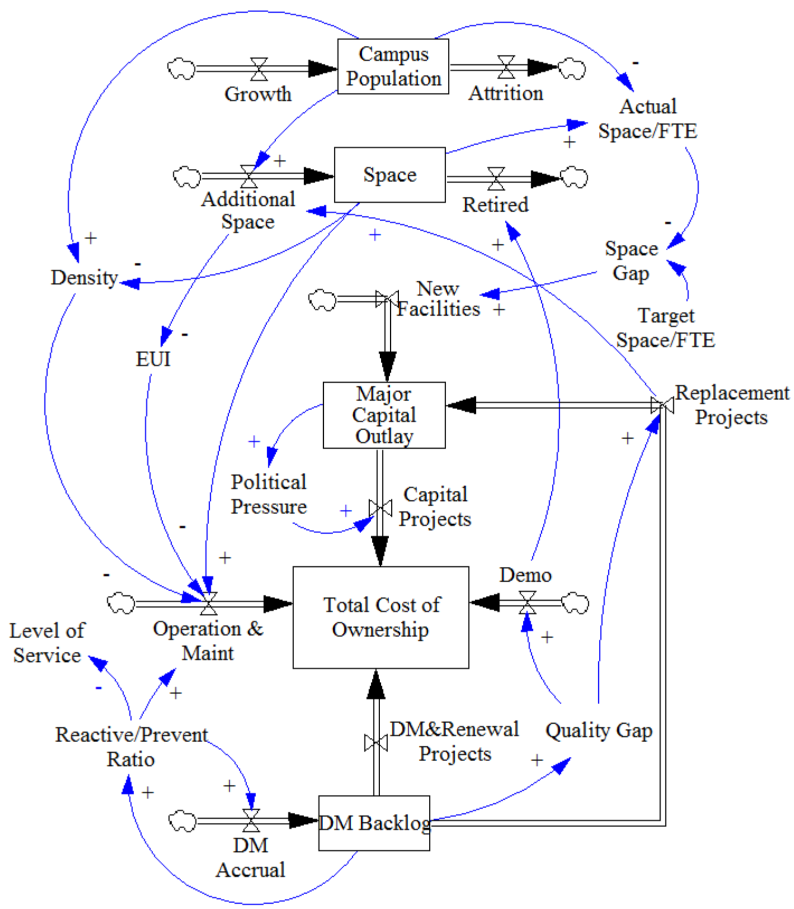
1. Existing campus budgets don't cover the deferred maintenance expense properly.
2. Ultimately, the campus is not responsible for funding these repairs.

While no single individual is to blame, the underlying problem is quite nefarious in its simplicity. The time delay associated with facilities degradation allows for leadership to both ignore the necessary investment and/or worse, blame past administrations for their inadequate stewardship. A fundamental problem is identified by Kaiser and Klein (2010),

> "Today, the average tenure of a president/chancellor is less than seven years, decisions made by any individual chancellor or president, during their tenure, must be part of a longer-range and continuous facilities stewardship process…"
>
> "Facilities stewardship therefore means high-level and pervasive commitment to responsibility for optimizing capital investments, to achieve a high-functioning and attractive campus. It includes a major commitment to capital asset preservation and quality. Stewardship is about the long view of an institution's past and future. It forms the backdrop for hundreds of discrete facilities investment and management decisions."

To help understand the dynamics at play, a mental model was created to identify the perceived total cost of ownership structure. The problem facing the CSU system is a lack of resource

Image II – Total Cost of Ownership Casual Diagram



investment at the Renewal phase of a facility's lifecycle. The impact of this problem can be traced to the ballooning Capital Outlay Program and perpetuance of reactive maintenance. Assuming under investment continues to occur in renewal projects; the State of California can expect to bear the burden of the burgeoning capital outlay program as this is typically a General Fund expense and does not impact the yearly operating budget allocation. Finally, further review of individual campus renewal allocations is warranted, but is not included within this study.

Dynamic Models

The dynamic models were created for multiple reasons, primarily to show that deteriorating facilities conditions have a dramatic impact on campus operations, specifically facilities management operations. Originally, the model was to focus solely on the CSU, Chico campus, but, many of the drivers were predicated at the systemwide level as the Capital Outlay Program is the key resource driver for capital projects. To simplify the analysis, two independent models were created, both with the same core assumptions and rates. The Systemwide model attempts to identify the variables that determine capital investment needs in facilities with attention paid to the basis of the Capital Outlay Program. The CSU Chico model predicts the conditions of all state facilities utilizing the Chico component of the CSU Capital Outlay Program. Together, these models help predict the facilities condition both at the systemwide and campus level over a 35 year period.

Systemwide CSU Capital Outlay Model

Within the model there are five core areas:

1. ***Deferred Maintenance and Capital Renewal***
   Facilities Systems Lifecycle and Reinvestment
2. ***Facility Growth***
   Impacts of Population Growth and Space Utilization needs
3. ***Major Capital Outlay Program***
   Systemwide Resource Allocation Program
4. ***Minor Capital Outlay and Energy Projects***
   Campus initiated and approved projects
5. ***Liabilities***
   Effects of Failing Systems

*6. ***Programmatic Needs*** – *Not included in model*
   Reinvestment to support evolving pedagogy and technologies

Deferred Maintenance and Capital Renewal

As mentioned above, systems and subsystems in facilities have a defined lifecycle. While a roof may have an expected life of 30 years, it's important to note that most systems typically degrade in an exponential manner. At year 29, the roof will be showing serious signs of wear and deterioration. The ideal model would utilize the respective decay curve for each system. The current system utilized by the CSU system focuses solely on deferred maintenance, which is defined as "…maintenance work that has been deferred on a planned or unplanned basis to a future budget cycle or postponed until funds are available" (Kaiser 2009). A roof that is 29 years old will show $0 in Deferred Maintenance which is accurate by definition, but incongruent with reality.

The depreciation of facilities has been formally identified in federal tax code since 1934. Current GAAP standards dictate that 80 years is the appropriate life of a fire resistant building ("Duke Financial Services" 2004). The lifespan is similar to that proposed by APPA. As mentioned above, a more accurate model would identify each system's rate of decay. The accuracy gained by this method would generate a higher rate of decay than the linear method, as the lifecycle curve shows that approximately 95% of the replaceable systems expire after 30 years of age. To be conservative and simplify the model, both dynamic models utilize a deterioration rate (DM Accrual) of 1.176%, which assumes a lifespan of 85 years. This core assumption is less than what is recommended by the National Research Council of 2%-4%. Kaiser and Klein (2010) provide further validation of this minimal rate, stating that Boston College utilizes a rate of 1.5% for their facilities renewal allocation.

From a capital renewal standpoint, the historical data from the past 13 years presents a wide array of possibilities. The maximum state funded outlay occurred in 2002/2003 totaling approximately $480m. The minimum state funded outlay occurred in 2009/2010 with a mere

$16m. On average, the state of California has appropriated $250m per year. As mentioned previously, funding requests for each project are identified by their respective phase (P,W,C,E). These partial requests are an acknowledgement that large facility projects take time, typically four years in totality. It becomes an art to time the outlay request with the phases of the project to ensure adequate funding exists to continue the project. With this in mind, it's important to look at four year averages, as this provides a better facility representation. The maximum, minimum and average four year span of capital outlays were $1.5B, $337M and $1B respectively. State funding is modeled utilizing the absolute value of a sine curve to introduce funding variability, with the 13 year average of the curve equaling $250m/year.

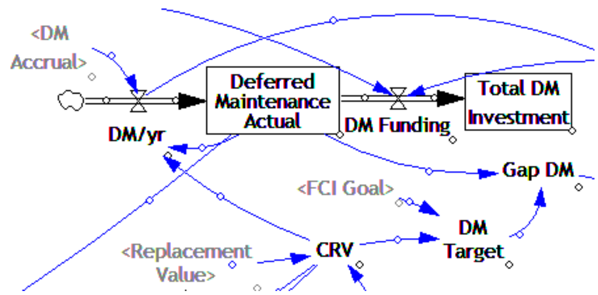


Image III – DM & Reinvestment System

Major Capital Outlay Program

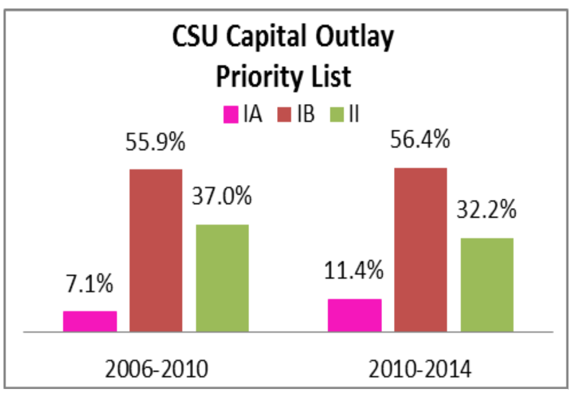
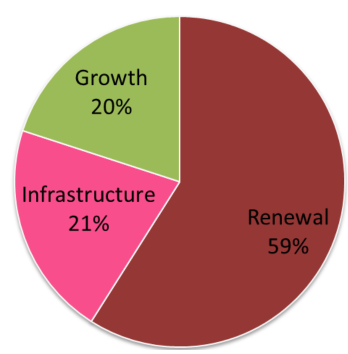


Figure III

The system created for the Capital Outlay Program is a basic series of stocks and valves. The model identifies all potential projects under Systemwide Project Need. This rate is determined by the Deferred Maintenance and Growth Needs of the system. Each campus specifies their priorities and the Five Year Capital Outlay Program is created. The approximately $6B dollar Outlay program is narrowed down to on average $520M for the Yearly Capital Outlay Priorities. The adjacent graph shows the historcal aveerges based of each project category (CAT).

Figure IV – Renewal Funding Breakdown



Further analysis of IB – Renewal Funding, specifically from the 2013-2014 capital outlay program shows that resources within this category are most likely to produce the allocation in Figure IV.

In reviewing the Capital Outlay Program, it became clear at the CSU, Chico level that the total needs of the campus are not being communicated in the 5-Year Outlay program. As mentioned previously, the CSU system has been collecting lifecycle data for years utilizing a program called FRRM. Each campus provides the appropriate data for their facilities and identifies any capital renewal that has occurred. The FRRM program analyzes the data based on lifecycle standards and ultimately generates a Deferred Maintenance (DM) Backlog value for each campus. As of 2012, the systemwide DM Backlog was $1.7B. CSU, Chico has the highest DM value in the system totaling approximately $145M and growing. The $145M is the accumulation of aged systems from all state funded facilities on campus. As expected, the Capital Outlay Program fails to identify this need directly, as it is a theoretical campus responsibility. To counter this unfunded mandate, campuses let facilities deteriorate to the point of disrepair, requiring either a major renovation or replacement, requiring inclusion on the Major Capital Outlay list.

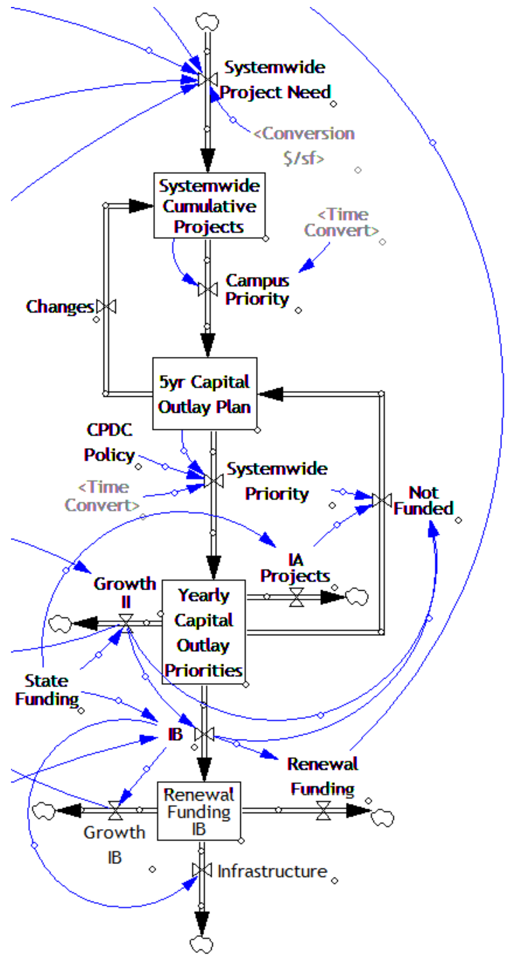


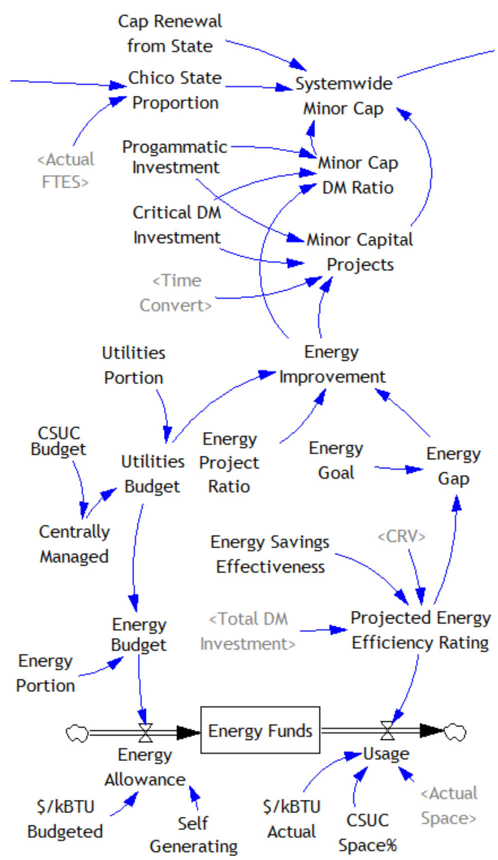
Image IV – Capital Outlay Program System

The restriction of only one project per active outlay year and no deferred maintenance projects creates a zero sum scenario, where each campus strives to receive the largest allotment possible; thereby decreasing the number of smaller renovation projects. Past historical outlay requests partially validate this theory, as the average yearly request for each project categorized as IB or II is approximately $19M. Replaceable Deferred Maintenance funding is not directly identified in any document. In reviewing project scopes and comparing their parametric costs to the request, a conservative Renewal Funding allocation towards deferred maintenance is 35%. An example of this situation is the Siskiyou II Science Replacement Facility noted in the Table II above, with a total project request of $75.9M. The project will replace the existing Siskiyou Hall, which occupies prime real estate on the core of campus and is in poor shape ($1.7M DM, 0.25 FCI). From a campus planning perspective, this project makes all the sense in the world, as the facility underutilizes land within the core of campus and would provide modern facilities for the College of Natural and Physical Sciences, which currently occupies two poorly conditioned facilities (Holt Hall-0.31 FCI & Physical Sciences Bldg-0.43 FCI). However, from a deferred maintenance perspective it appears that the new Siskiyou II project will utilize $75.9M to solve a $1.7M problem (Siskiyou's current DM Backlog) and $10M problem (Physical Sciences' current DM Backlog) With the two facilities combined, 15% of the project total is being utilized to offset Deferred Maintenance. Looking at CSU, Chico's request further, the total of the 5 year outlay request is $287.5M. If these projects were all funded and constructed, approximately $21M in Deferred Maintenance would be addressed (assuming all systems are renovated), leaving at least $124M in campus wide Deferred Maintenance backlog without considering further accrual.

Minor Capital Outlay Program and Energy Projects

Minor Capital Projects are defined in California Public Contract Code as projects whose construction costs are less $610k. In past outlay programs, the Chancellor's Office typically makes a systemwide request for either Capital Renewal, or Minor Capital projects. While Capital Renewal may consist of projects exceeding the Minor Capital threshold, they are typically less than $3M and are almost strictly used to repair failing systems. The amount received ranges historically from $0 to $77M. Over the past 13 years, this averages out to $20.2M a year systemwide. Distribution of these funds is managed by the Chancellor's Office, typically based a campus' percentage of maintainable space in relation to the total space within the system.

Image V – Minor Capital Outlay and Utilities



Additionally, campuses are mandated to fund all maintenance projects from their own operating budget per EO 847. But, due to the time required for a facility to decay, minimal investments are made, which typically focus on failed systems. This behavior is not unique to the CSU and as it was well stated in the 1998 study, "Stewardship of Federal Facilities."

> *"Because facility deterioration occurs over a long period of time, it may appear to senior executives and public officials that the maintenance and repair of facilities can always be deferred one more year without serious consequences in favor of more urgent operations that have greater visibility. Unless a roof actually falls in, senior managers are not likely to be held accountable for the condition of a facility in any given year. Yet they are held accountable for current operations. Consequently, public officials and senior executives have few incentives to practice effective stewardship of the federal facilities portfolio and are subject to few penalties if they do not."*

As more funds are invested in energy projects, the return on investment requires a longer payback as the highest return on investment projects are assumed to be targeted first, creating a balancing loop. This effect is not currently modeled, but the improvements to EUI are minimal, indicating that model structure is conservative.

The model for energy investment is based on the CSU, Chico budget, with Chico's ratio of students to the system being the modifier. In total, the Systemwide Minor Capital yearly investment is estimated to be about $50.9M which includes both the state and campus appropriated funds. The model also tries to utilize the Energy Use Intensity (EUI) metric to show that reinvestment in existing facilities will lower energy use ("What is EUI?" 2012). Further research is necessary to consider these results as valid. But, the overall concept is sound, providing awareness to operational costs that are a function of the energy efficiency of the campus and the exogenous cost of energy.

Facility Growth

The CSU has a very thorough space utilization program. The program follows HEGIS standard nomenclature. The CSU has defined space standards and formulas to analyze the difference between what the standards call for, and what space actually exists ("CSU Space Planning Intro to 1-2" 2012). To be deemed a need, the campus must show that capacity deficiencies exist, either utilizing existing FTES or future FTES as the key variable. Growth projects must be identified within the campus master plan as there are numerous planning challenges that can occur as more FTES are brought to a campus.

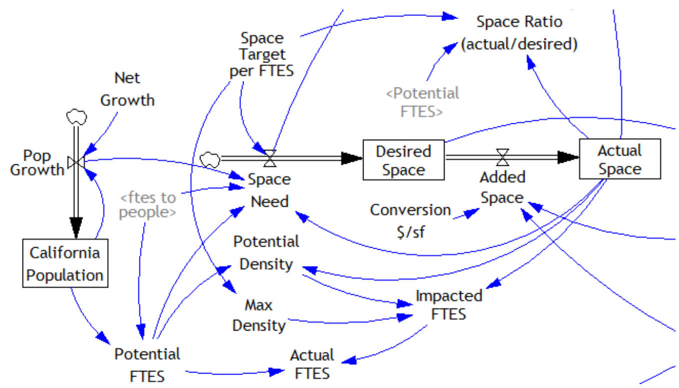


Image VI – Growth

To simplify the analysis, growth projects are simply predicated on population growth. Current estimates predict that California will grow at a 1% rate into the foreseeable future (Trounson 2012). This rate underestimates the impending spike in the current high school demographic (some estimate as high as a 1.4% growth rate over the next ten years (Schnagl et al. 2012)). Additionally, the model assumes that the system has enough space to meet its current enrollment needs.

Liabilities

Finally, if the overall facilities condition is deteriorating, there are secondary impacts that will occur to maintenance operations. Non-academic studies have shown that when the facility condition index (FCI) approaches 0.30, maintenance staff are severely impacted (King et al. 2012). From analyzing hundreds of campuses, Sightlines Inc. proposes that if levels of service remain static, operation budgets are impacted

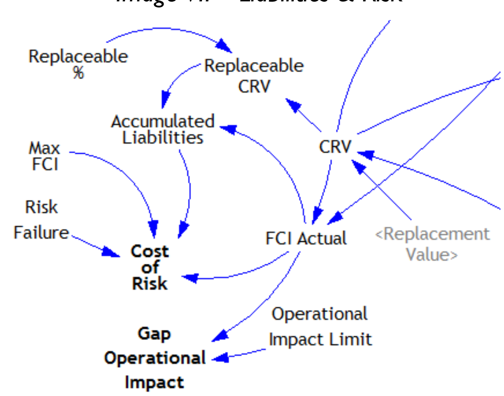


Image VII – Liabilities & Risk

by a factor of 3. This information has been used as justification nationwide for other campuses and university systems to invest significantly in either a large outlay or a consistent budgeted deterioration allotment. This concept is expanded further in the CSU, Chico model and is used here as supplementary data.

CSU, Chico Master Plan Model

CSU, Chico Master Plan

The campus master plan is a critical document for each university within the CSU System. This document serves multiple purposes from a planning standpoint, as it is a major component of the campus' Environmental Impact Report (EIR). The EIR is a legal document that ensures compliance with the California Environmental Quality Act (CEQA) and facilitates discussions with the community at large in regards to campus growth, projects, etc., long in advance of the actual projects. Additionally, the University is insulated from legal challenges to an extent as long as the project or initiative is identified properly within the EIR. Depending on the campus' preference, the document can be defined at the program level (campus) or project level (explicit facilities), and is therefore a mix of high level and explicit analysis. The master plan does not necessarily communicate the order of projects, but rather identifies all near term projects.

The Major Capital Outlay Program is utilized as the refining document, identifying the campus priority for projects identified on the Master Plan. As mentioned previously, the CSU, Chico Five Year Outlay only identifies six new projects. While the outlay shows the funding to occur over a five year period, historical analysis shows that at a minimum, five years will span each allocation. Therefore, the model spreads these projects evenly over the next 30 years for completion of this list.

Campus Facilities Condition

The model utilizes a nearly identical deterioration structure in comparison to the CSU Systemwide model. The focus on the CSU, Chico model is the facility condition status. Every facility deteriorates. It's proposed that a facility goes through five stages in total; New, Aging, Expired, Failure, Dead.

New	Aging	Expired	Failure	Dead
0	FCI<0.30	0.30<FCI<0.40	0.4<FCI<0.53	FCI>0.53

Table IV – FCI Stages

A facility is never truly **New**. Wear and deterioration start almost immediately for individual subsystems. A facility starts **Aging** after year 1, coincidentally when the contractor's warranty expires. The facility deteriorates steadily, even under normal maintenance. At a certain point, systems start reaching their theoretical lifecycle and are considered **Expired**. Like the milk in a fridge, it can be used past the expiration date, just with risk associated in doing so. The Expired facility soon starts going into **Failure** mode, where systems are randomly failing. Typically, the wave is so large that it makes little sense to reinvest in the facility, at which point it is considered **Dead**. The CSU, Chico model utilizes FCI as the metric used to determine the phase of the facility. The FCI value is capped in the model at 0.55 as the focus of this study is on replaceable systems. Deterioration may occur in non-replaceable systems, but is not analyzed within this study.

Risk Pool

As facilities deteriorate they become potential liabilities from an operations standpoint. Critical systems will begin to fail, causing both an impact to daily operations and the overall campus budget. While initial failure costs will most likely impact the Maintenance budget at first, the scale of the problem will require a larger funding source to keep the facilities in operation. The model addresses this aspect by allocating all costs associated with failure probability to the Risk Pool. The impact to the risk pool is modeled as follows:

2.5% Dead +0.5% Failure +0.1% Expired.

The probabilities chosen are anecdotal but are assumed to be less than actual. Analyzing historical reactive work orders, in correlation with the facilities condition index would provide more credible probabilities.

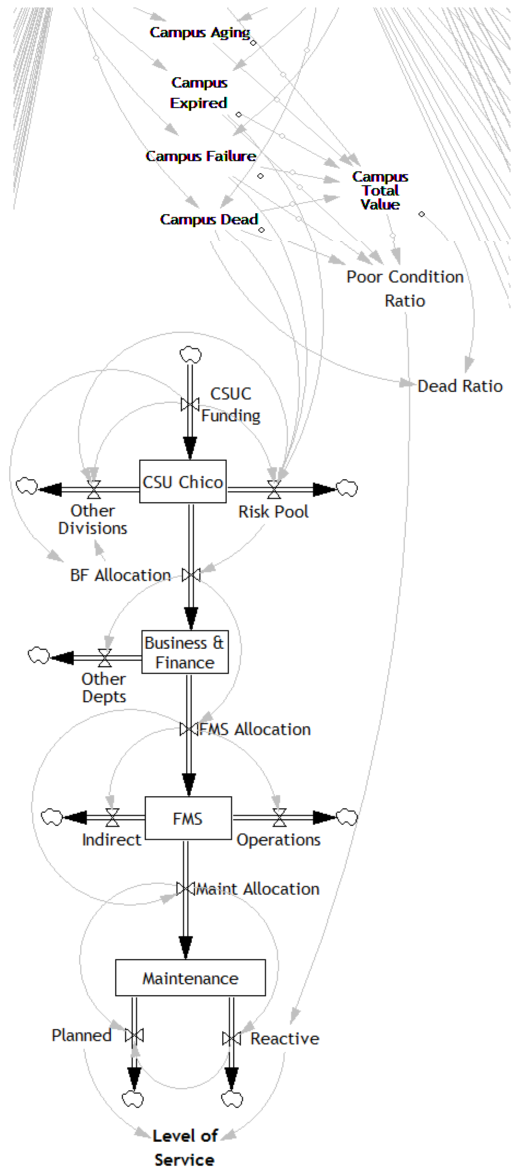


Image VIII – Risk Pool & Level of Service

Maintenance Operations

As facilities deteriorate, there is a detrimental impact to the maintenance operation. In the federally funded study, "Committing to the Cost of Ownership", the highest ratio of reactive to planned work is proposed to be 0.30 (Committee on Advanced Maintenance Concepts for Buildings 1990). As this ratio increases, typical scheduled maintenance routines become interrupted as the focus becomes triaging reactive work orders. In an ideal situation, staffing levels could be increased to accommodate both. This is rarely the case. Instead the level of service to the campus deteriorates. Simple tasks that are rote, such as changing a light bulb, are not performed in a timely manner. Light bulbs can go weeks without changing, as long as there is additional light in the area. Another classic example is loose or hanging 12"x12" ceiling tile, waiting to fall. Worse, the culture of the entire organization shifts, continually lowering expectations. This shift is conveyed to the campus in various forms most acutely with long time delays.

From a strategic perspective, ultimately, the inability of the maintenance staff to keep up with the decay will impact operations on campus. This impact while not explored in depth can be quite dramatic, as the campus serves multiple purposes, with the primary focus on student achievement. Losing one facility for any length of time will impact on average at least 600 classroom or laboratory stations. Over the course of a day, the facility is turned over approximately 6 times; meaning 3600 classroom hours will be lost if a building has an unplanned maintenance event for one day. Further, there is an intangible component to the state of facilities. As has been well documented, there are various forms of incentives that management can provide (Herzberg 2003). Typically, one of the simplest means of acknowledging employee's value is by showing respect. A few years ago at an academic summit, the number one priority developed by a group of academic faculty and staff was to study and teach within a professional setting. While professional can be considered a subjective term, it most likely does not involve lights out, hanging ceiling tiles, or worse, a drip pan draining to a bucket in the middle of a classroom, as the adjacent picture highlights. By continuing to allow these conditions to occur, the CSU system is inadvertently showing signs of disrespect and asking the campus to perform in a challenging environment, which ultimately impacts the success of students, faculty and staff.

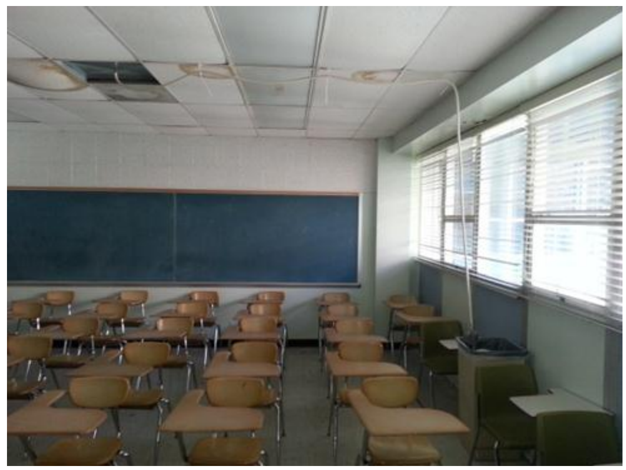


Image IX – Active Classroom – Physical Sciences Building

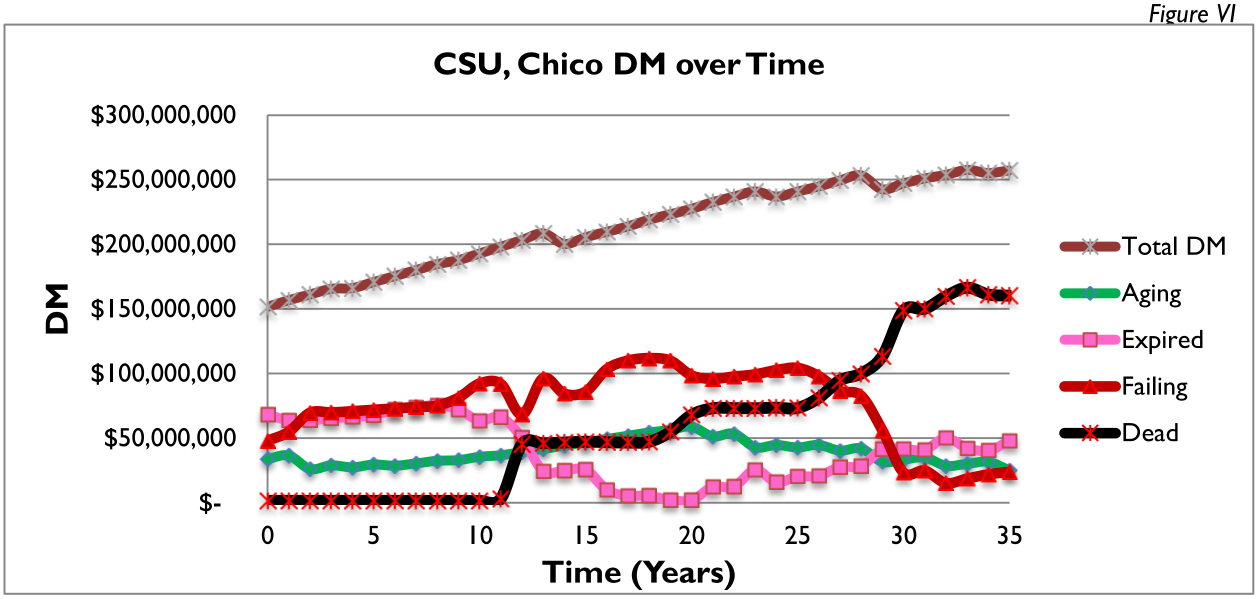
Model Results

CSU, Chico Master Plan

The behavior of the CSU, Chico Master Plan model follows the Fixes-That-Fail archetype. With minimal resources to reinvest in a large array of facilities, the campus deteriorates steadily. The implementation of the master plan provides only minor, temporary improvements.

One of the more alarming results from the model is the value of Dead facilities in 35 years, totaling roughly $160M. Due to the age of the campus and absent any true capital reinvestment program, facility conditions will be extremely poor by 2048. The following graph highlights the various facility phases from a Deferred Maintenance perspective.

Figure VI



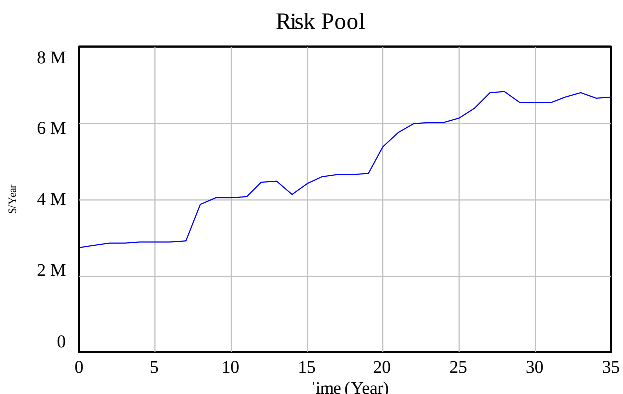
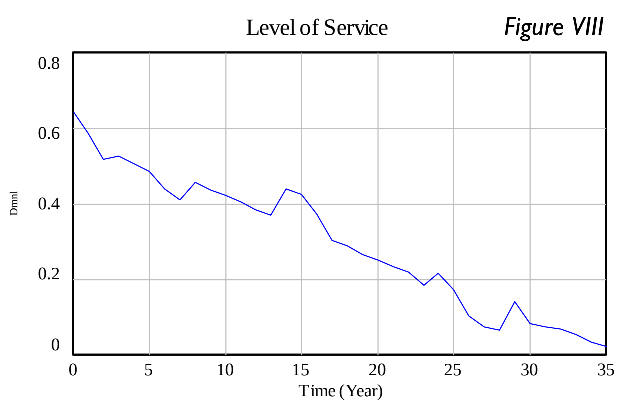


Figure VII

As expected, the accumulation of dead and failing facilities has a negative impact on the overall campus budget. In the next ten years, the model predicts that yearly, an additional $2M will need to be reassigned to triage decaying facilities.

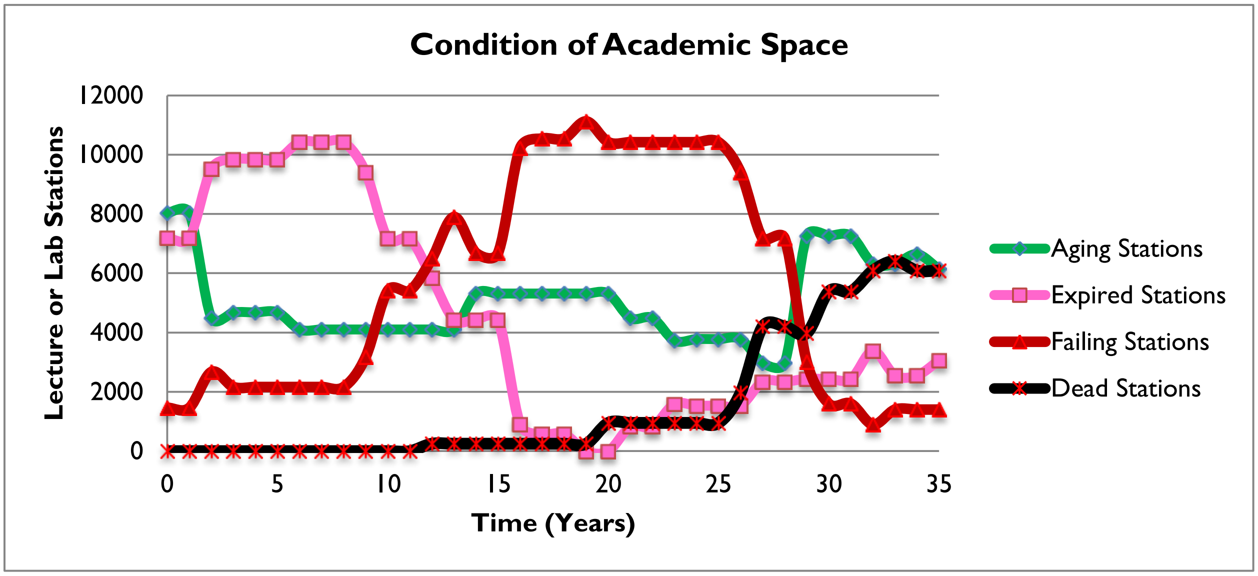
Figure VIII



Consequently, the level of service provided by the maintenance department will steadily erode. Unfortunately, reactive maintenance will dominate. This behavior causes a secondary impact, which is not included in this model, in that facilities that are poorly maintained will degrade faster than those which are actively maintained, further exacerbating the problem.

Finally, the mission of CSU, Chico will become compromised as the quantity of Failing and Dead Stations grow rapidly. As can be seen in Figure IX, within the next 15 years, the majority of the University's classes will be held in spaces that are considered Failing, with an FCI greater than 0.40.

Figure IX



Systemwide CSU Capital Outlay Model

The systemwide model exhibits similar behavior to the CSU, Chico model in that there is a steady increase in the accumulated Deferred Maintenance. If funding continues at its historical average and distribution of resources remains the same, the FCI of the system will continue to deteriorate, growing from 0.13 to 0.25, which is the accumulation of $2.3B worth of Deferred Maintenance. Systemwide, absent any policy and implementation change, the entire CSU system will be in a similar state to that of today's CSU, Chico Campus.

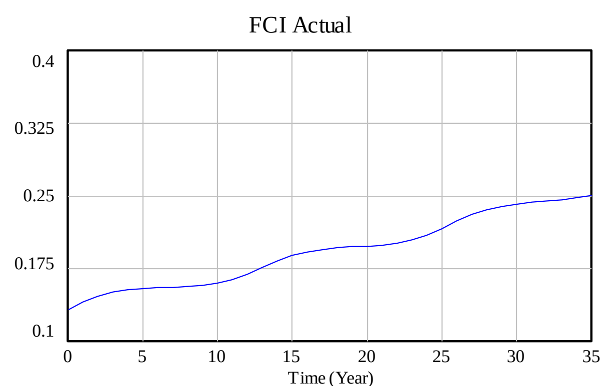


Figure X

One of the fundamental problems for the system is defining hierarchy of needs. With a finite budget, theoretical targets are rarely reached due to inadequate funding. For instance, the CSU space utilization policy states that the target ratio of Assignable Space (ASF) to FTES is 75sf. The model utilizes Gross Space (GSF) and by mandate, ASF must be at least 60% of GSF. The model therefore utilizes 125sf as the target for space demand. The stated total GSF for the state system is 42.6M sf which equates to 340,800 FTES. Yet, the system was operating at its maximum in 2008 at 470,000 FTES. This begs the question, what truly is the current capacity of the system? While reality suggests that there is spare capacity, the base model indicates that additional space is required. The most likely culprit for the system's ability to fluctuate is that each campus can adjust their space utilization for specific hours of operation. At most campuses enrollment is heaviest on Tuesdays & Thursdays and under enrolled on Fridays. Further, on the CSU, Chico campus buildings are assigned to colleges who get priority for their respective classrooms. Underutilized space is common (I'm currently in a class with 10 students in a room that seats 50) as each college's goal is to secure space, not optimize the use. The current model does not optimize the space utilization system, but this calculation should be identified for future analysis.

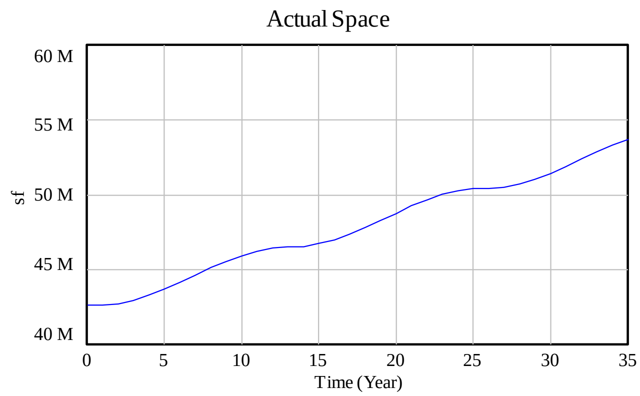


Figure XI

As expected, the Capital Outlay Program becomes a series of reservoirs, collecting built up facility needs all dependent upon the funding rates of the system. The model indicates that there is a fairly consistent systemwide need, with moderate growth over time. This main valve is fed by both the Deferred Maintenance Accrual and Space needs. Future development of this model will allow for Programmatic needs to be included in this stock.

The stock that shows the fastest growth rate is the 5 Year Capital Outlay Plan. The rationale behind this behavior is straightforward; the system is communicating that it has a static need of approximately $520M. As time passes, neither space needs nor deferred maintenance needs are met by state funding, creating a bottle neck at the 5 Year Capital Outlay Plan.

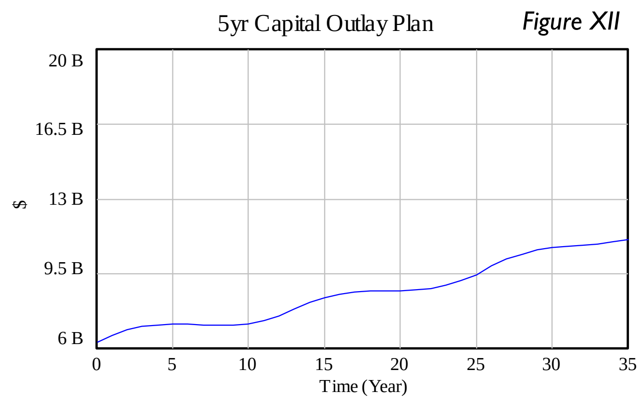


Figure XII

The combination of all stocks represents the total systemwide facilities need. If funding were sufficient to satisfy the demand, the level within the stock would remain at or near constant. Unfortunately, this is not the case, as the needs of the system are growing, with both increases in population and decaying facilities. The combined need grows rapidly in

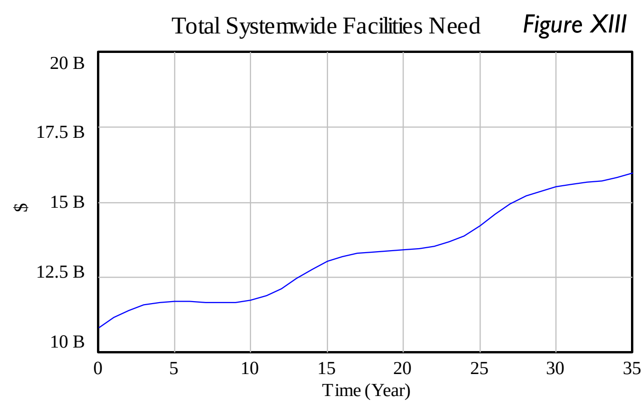


Figure XIII

the next 35 years, increasing by approximately 50%.

Potential Solutions

The problems at both the systemwide and campus level revolves around adequate funding. If facility planning, maintenance and operations are to continue as they have since the 1960's, additional resources are needed to ensure that state assets remain assets, and not liabilities. Conversely, the facility system could be reengineered to be more dynamic, especially in consideration with today's academic needs. The 1960's classroom and campus did not have a virtual component to potentially offset demand, nor did it have hazardous conditions to remediate prior to construction. Even the pedagogy within the classroom is evolving, as there is growing support for the "flipped classroom." With both these ideologies in mind, alternative solutions will focus on the following:

- **Increased Funding – Various Sources**
  - Student Fees or State Bond
  - Localized Bond Sale
  - Corporate Sponsorship
- **Adjustable Resource Allocation**
  - Focus on Sustaining Current Facilities, Lower Growth Priorities
  - Adaptability Planning Focus

Increased Funding

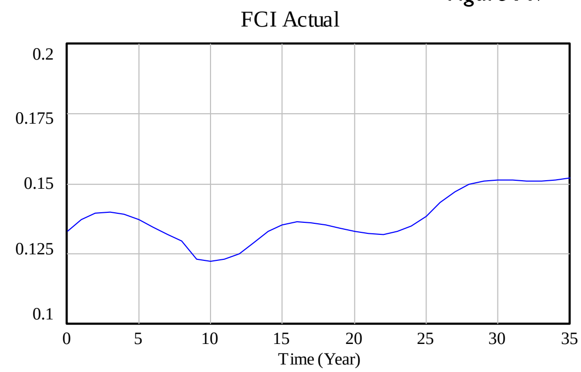
The past five years have proven that the funding support by the state of California is subject to the volatility of the state economy. Unfortunately for all campuses within the system, the needs of the CSU are caught in the state political web, oftentimes used as leverage to sway voters for or against a position.

With this in mind, the most probable mechanism to raise funds for systemwide facilities would either be through a bond sale or student fees. There are a few different possible scenarios, such as the state carrying the bond debt, or students supporting the bond debt through a new fee. Similarly, rather than receive a large outlay at once, a student fee could be instituted to provide a consistent level of funding for deferred maintenance projects.

On the CSU, Chico campus, a recent measure was passed in support of the new Wildcat Recreation Center. The fee each student on campus must pay to ensure proper coverage of the bond debt is roughly $500/year. Using this value across the system produces a total bond sale of roughly $2B, depending upon the current bond rate. Conversely, the fee could generate consistent revenue of on average $208M per year, providing over $7.3B spread across 35 years. Neither scenario includes inflation. For actual results to mimic the model, the student fee would have to be adjusted frequently for inflation, otherwise the buying power of $200M will be significantly less 35 years from now.

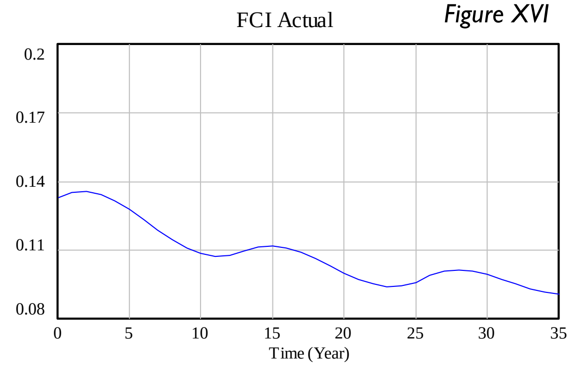
The results of both options ultimately fail to keep the facility condition index from worsening. Of the two options, consistent support provides the greatest stability to the condition of facilities. As can be seen in the adjacent graph, the facilities condition index increases by approximately 15% over the next 35 years, but is still well below the threshold of 0.30.

Figure XV



Another option utilizing consistent student fee funding would be to appropriate these resources strictly to projects categorized as IB – Renewal and Renovations. The distribution of state supported resources would remain as originally designed, IB would simply see an influx of $200M per year. This potential solution provides the greatest relief to the facility conditions, ultimately lowering the FCI by 45% to a value of 0.07, which is below the recommended NACUBO maximum of 0.10. The CSU system as it currently exists ignores a key cost in the total cost of ownership, Deferred and Programmatic Maintenance. Focusing a new student fee on this key cost would help to ensure that students learn in a professional setting, ultimately helping with long term student success.

Figure XVI



Still another financing option would be to allow the California Universities to raise fiscal support locally, similar to community colleges. Currently in the state of California, community colleges are included in K-14 bond sales. These bond sales are typically supported by either increased property taxes or local sales taxes which requires voter support. Political hurdles would be difficult to overcome, as most campuses support numerous counties, eliminating the ability to isolate voters. Regardless, the ability to raise funds locally, avoiding the California State budget nightmare, would provide the entire system a chance to operate strategically in regards to maintaining its long term assets.

Rather than accumulating more debt or fees, an untapped source of revenue would be to actively pursue corporate sponsorship of facilities throughout the system, similar to corporate sponsored stadiums and arenas. Currently, the naming of facilities is a beaurocratic quagmire. In general, most facilities on campuses are named after either a campus historical figure or a county of the state of California. While it may be unsettling to make such a dramatic change; in an economically challenged environment, the system is obligated to exhaust all avenues to generate needed resources. The opposite approach of doing nothing creates great liability for the campus and ultimately the state. Deteriorated facilities can pose numerous hazards to occupants, from mold allergies and legionnaire disease, to broken handrails, elevator failures and even falling structural elements.

From a sales standpoint, the entire system could be compared to athletic arenas. For example, business majors comprise approximately 10% of the total student population at CSU, Chico. Assuming this percentage is consistent across the other 23 campuses, 42,500 students daily utilize business facilities. If naming rights for all business school facilities were sold to a corporate sponsor, the potential return could be upwards of $120M over 20 years, or $6M per year for business schools alone (Sauter 2011). On the Chico campus, receiving $6M once over 23 years to renovate the business facilities would almost eliminate their current combined deferred maintenance and reinvestments would keep pace with lifecycle replacement costs.

Flexible Priorities

Owning assets without the ability to maintain them is both irresponsible and neglectful. Regardless of the funding mechanism, the priority of the system could shift from growing and replacing, to maintaining and renovating. Unfortunately, our facilities were not built with longevity in mind which leads to the existing conundrum; why reinvest in a facility that isn't worth saving? If resources were no object, removing old antiquated facilities with those more dynamic and efficient would be the goal of every campus. But, resources are limited. Therefore, the obligation of both the system and the campus is to optimize investments in support of the strategic goals of the organization. Simply put, invest resources that support the core mission in a strategic manner. What this means to a campus is that not all buildings hold equal value. If a hierarchy were to be established for each facility in its relation to the mission of the University, it may look like the adjacent pyramid.

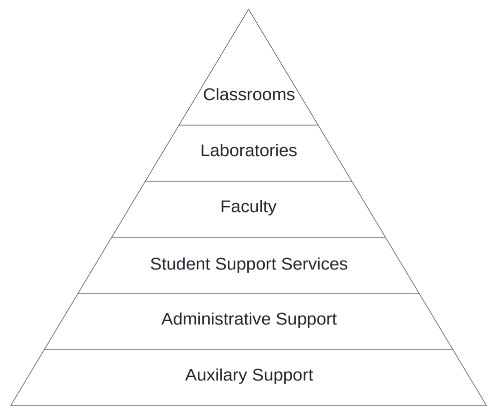


Image X – Facilities Hierarchy

The next question to be asked is what should the facility state for a classroom or laboratory be? Is it acceptable to have lights out, leaking ceilings or window, non-operable window blinds, too few electrical plugs, falling ceiling tile, too hot/cold, too many desks, etc.? The answer should always be no. For this to be remedied, each facility must be renovated on a more frequent schedule. To put this in context, a current joke we have on campus is our ability to travel in time. If we desire to travel to

Image XI – Plumas Hall Classroom

1961, we can go to a classroom in Physical Sciences Building. If we desire to travel back in time to 1972, we can go to a classroom in Plumas Hall. The rationale behind this joke is that by and large, the facilities and classrooms throughout campus have not been touched after their original construction. While no one individual can be blamed for this situation; this practice can and must be remedied. There are two main corrections that can be made which will redistribute funds more evenly.

1. **Reduce the amount of investment in growth projects.**
   The mission of the CSU states that all qualified California students are to be accepted. Satisfying this goal while limiting growth of facilities will become a new challenge. Ultimately, it could be overcome; either through partnership with community colleges or through the virtual classroom. A more detailed dynamic model would help forecast where critical investments should be made.
2. **Limit the size of the Major Capital Project**
   While this feels inherently wrong from a planning standpoint, when viewed from the facility condition lense, it ensures the greatest likelihood of stability across the system. Further investigation is warranted in reviewing densification opportunities. For instance, if the major capital system were to allow for large projects but require the removal of multiple facilities; operational costs would be saved over the long run. The value in operating under this condition would only be realized if these savings were reintroduced into the capital outlay system to protect against a zero-sum situation.

The impact of these two options can be seen at both the systemwide and campus level. If CSU, Chico were funded at an average of $11M per year, which is the average Major Capital allocation over the past 13 years, the Facility Condition Index would zero out in 30 years. Growth at the campus would be stagnant under this scenario, but all facilities would be maintained in acceptable conditions. Similarly, Systemwide Deferred Maintenance would be reduced by approximately $800M in comparison to the base model. It’s important to note that focusing on deferred maintenance only allows for replacement of existing systems. While these systems would be improved, the facility would only be as good from a programmatic state as originally designed back in the 1960’s or 1970’s. Identification of additional renewal funds to repurpose spaces would provide the greatest benefit and return on investment for both the academic and facility needs.

Neither of these options solves the long term systematic problem of balancing the needs of the CSU. To obtain a comprehensive picture, additional research must be spent in developing both an adaptability index and programmatic index for each facility ("Framework for Facilities Lifecycle Cost Management"). Determining the adaptability index is a task that the facilities management team can perform. An adaptability model proposed by researchers from Hong Kong provides breadth in analysis and could be used a starting point for the CSU (Langston et al. 2008). Once an adaptability index is established, facilities could be ranked, creating a priority list for whatever minimal reinvestment each campus will make into its facilities. Facilities that are not considered adaptable could be phased out, with the campus goal of ensuring that no classes are taught in squalid conditions. With the establishment of the adaptability matrix, the campus could begin collaborative discussions with the academic community to ensure that high priority facilities meet the needs of the user, providing the best possible learning environment. Similar to the adaptability index, the programmatic index would establish a priority list, ensuring strategic reinvestment into the existing facilities.

Conclusion

The facility conditions at the CSU, Chico campus are starting to reach their tipping point. The current renewal system does not adequately address this looming crisis. To avoid calamity and proactively manage its assets, both the campus and the CSU at large must identify a better means of maintaining their assets. Excuses of reduced funding simply pass the blame on to the state government and do little to provide solutions. The dynamic models created show that there are options out there that will ensure reliable classrooms and campuses. Situations like the electrical failure at Fresno are almost entirely avoidable if resources are reinvested into facilities. The impacts of not doing so only create a greater financial burden for campuses and ultimately the state taxpayers. Critical investment in CSU facilities is needed to ensure our goals and sensibilities are not eroded to the point of despair. It's incumbent upon all of us within the system to demand and create a better, safer and more reliable learning environment.

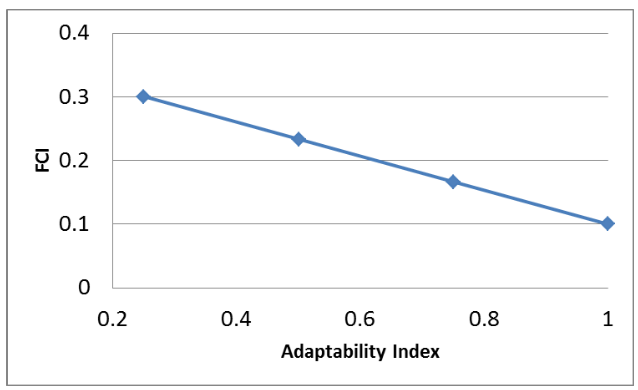


Figure XVI – Max FCI Curve

One of the behavioral causes of the situation is complacency, of both the campus and the system. To help avoid rhetoric and actually focus on solving the larger problem, a **Max FCI** must be established for all facilities within the system. Relevant ranges can be established and determined as a function of the adaptability index or some other similar index that takes the hierarchical needs into consideration as well. While this won't actually bring additional revenue into the system, it will allow for a common language across all campuses to communicate through, ensuring that scarce resources are being used strategically on the priorities of the system. Regardless of Adaptability Index, operating facilities that have a FCI greater than 0.3 is not fiscally sound and should be avoided at almost all cost, as the return on investment in the facility will most likely be paid back through operational savings and the avoidance of potential risk liabilities.

It's apparent at the CSU, Chico campus that change is needed. While it would be easy to recommend increased funding or even reallocating resources, neither of these identify the root cause of the problem. Growth and building replacement are critical processes to the overall facilities plan of campuses and can't be ignored. Similarly, for far too long, Deferred Maintenance throughout the system has been ignored. A robust dynamic model would allow administrators to act with clarity. A balanced system must be established to ensure long term viability for the 23 physical campuses within the system. At each individual University, the problem is not simply a Business and Finance problem, but rather a campus wide problem. Collaborative discussions must take place to educate deans on both the theory of facilities management and the expected state support. With a common understanding of the systems at play, a strategy can be developed, providing a unified campus approach.

Unfortunately, balanced systems are hard to come by. But, with some incremental improvements, the largest university system in the world can move towards a more sustainable future. First, clarity and transparency must to be brought to facilities management within the CSU. In reviewing multiple annual reports both at the system and campus level, it became clear that very few documents were highlighting the current deferred maintenance backlog. Further, those that were, were doing so in such broad terms that it sounds like another administrator lamenting about the lack of state funding. To sell any idea, one must be made aware of a product, educated about the product and then sold on the product's value. Similarly, the public must be made aware of the problem, in terms that create meaningful dialogue. Doing so will ensure that they become educated on the impacts of underfunding. With time, negotiation, determination and perseverance, changes will occur. The story that needs to be told for the system is the total cost of ownership. In design stages, life cycle costs are analyzed to ensure buildings minimize long term costs. This is only one component of total life cycle costs. The appendix includes a proposed total life cycle cost template for both the system and for CSU, Chico. Rather than utilizing accounting documents and past lexicon that covertly speak of operational funding and depreciation, annual reports must reference the total cost of facilities ownership, as this is the true cost of operating and maintaining a campus.

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Appendix A: Glossary of Terms

Facility Condition Index (FCI) Unitless:

The ratio of Deferred Maintenance Costs to the Current Replacement Value.
FCI = DM/CRV (Kaiser 2009)

Deferred Maintenance (DM) ($):

Maintenance Work that has been deferred on a planned or unplanned basis to a future budget cycle or postponed until funds are available. (Kaiser 2009)

Current Replacement Value (CRV) ($):

The estimated cost of constructing a new facility containing an equal amount of space that is designed and equipped for the same use as the original building, meets the current commonly accepted standards of construction, and also complies with environmental and regulatory requirements. (Kaiser 2009)

Defined as $294/sf for "Basic and $491/sf for "Complex" facilities within the CSU.

Gross Space (GSF) (sqft or sf):

The total quantity of space for a facility, including general and utility spaces.

Full Time Equivalent Student (FTE or FTES`):

The total number of credit units taken by all students in a term or year divided by the number of units a full time student takes during an academic year (30 units per semester).

FRRM Lifecycle Model:

Database-Model utilized by the California State University System to track facility lifecycles and Deferred Maintenance backlogs.

Major Capital Outlay Program:

Consists of all projects exceeding $610,000 in construction costs.

Minor Capital Outlay Program

Consists of all projects up to $610,000 in construction costs

Executive Order 847 (EO 847):

Directive from the California State University Chancellor in regards to responsibilities for campus facilities management.

Energy Use Intensity (EUI) (kBtu/sqft):

A unit of measurement that describes a building's energy use. EUI represents the energy consumed by a building relative to its size. Avg. Office Building = 193 (

Appendix B: FRRM Data

State Funded Facilities

		FCI SUMMARY REPORT		(000's)	(000's)		
		Building	GSF	CRV	Backlog	FCI	Built
FAILING		FMS ADMINISTRATIVE OFFICE	5,335	$816	$351	0.43	1974
		SIERRA HALL AND ANNEX	4,001	$661	$284	0.43	1926
		UNIVERSITY STADIUM-FIELD	206,287	$3,155	$1,357	0.43	1963
		FMS WAREHOUSE	21,521	$3,292	$1,326	0.40	1968
		MERIAM LIBRARY	269,018	$88,789	$35,637	0.40	1958, 1972
EXPIRED		PHYSICAL SCIENCE BLDG	84,814	$24,635	$9,698	0.39	1961
		BUTTE HALL	88,874	$30,014	$10,999	0.37	1972
		KENDALL HALL	51,232	$16,249	$5,953	0.37	1929
		TRINITY HALL	26,817	$8,505	$3,028	0.36	1933, 1975
		GLENN HALL	41,245	$12,112	$4,173	0.34	1959, 1994
		LANGDON ENGINEERING CTR	58,249	$17,106	$5,767	0.34	1967
		SHURMER GYMNASIUM	24,305	$7,138	$2,388	0.33	1956
		PERFORMING ARTS CENTER	111,132	$32,636	$10,426	0.32	1967
		HOLT HALL	130,610	$64,126	$19,930	0.31	1972
		LAXSON AUDITORIUM	33,092	$10,495	$3,134	0.30	1932
AGING	Poor Condition	PLUMAS HALL	64,015	$18,799	$5,481	0.29	1972
		STADIUM RESTROOMS (EAST)	446	$131	$38	0.29	2008
		ACKER GYMNASIUM	70,673	$20,754	$6,005	0.29	1962
		SELVESTER CAFE	9,388	$2,757	$786	0.29	1957
		AYMER JAY HAMILTON BLDG.	36,857	$10,824	$3,037	0.28	1950
		MODOC HALL	35,225	$10,344	$2,747	0.27	1964, 1999
		FMS TRADES WAREHOUSE	3,247	$497	$124	0.25	1968
		SISKIYOU HALL	23,344	$6,855	$1,695	0.25	1957
		BOILER-CHILLER PLANT	13,710	$4,026	$921	0.23	1972
		FARM BUILDINGS	96,935	$14,826	$3,188	0.22	1963
		STUDENT HEALTH CENTER	22,296	$6,548	$960	0.15	1974, 1994
	Good Condition	AYRES HALL	45,803	$13,543	$1,520	0.11	1932
		CONTINUING EDUCATION	8,276	$2,625	$226	0.09	1949
		SAPP HALL	6,202	$1,967	$93	0.05	1884
		COLUSA HALL	12,898	$4,091	$148	0.04	1921
		TEHAMA HALL	90,157	$26,476	$109	0.00	1992
		A.E.W RECEPTION CENTER	5,650	$1,792	$0	0.00	1923, 2000
		BOHLER BASEBALL FIELD	44,000	$673	$0	0.00	1997
		FMS GARAGE	5,878	$899	$0	0.00	1968
		GATEWAY SCIENCE MUSEUM	9,656	$4,741	$0	0.00	2008
		NETTLETON STADIUM-BLDG	8,364	$1,279	$0	0.00	1997
		O'CONNELL TECHNOLOGY CTR	74,566	$21,898	$0	0.00	1992
		STUDENT SERVICES CENTER	119,865	$35,200	$0	0.00	2008
		YOLO HALL	70,626	$20,741	$0	0.00	2002
		UPD/EHS	8,200	$2,403	$0	0.00	2012
		Campus Totals	**2,042,809**	**$554,418**	**$141,528**	**0.26**	

Appendix C: CSU, Chico 2013/2014 Capital Outlay Program

Five-Year Capital Improvement Program 2013/14 through 2017/18
(Dollars in 000's)

CHICO
State Funded

Project	FTE	CAT	2013/14		2014/15		2015/16		2016/17		2017/18		Funds to Complete	
Taylor II Replacement Building	N/A	II	E	2,693										
Siskiyou II Science Replacement Building	31	IB	P	2,271	W	2,253	C	67,640			E	3,732		
Butte Hall Renovation	0	IB			PWC	47,372					E	1,087		
Utilities Infrastructure	N/A	IB					PWC	39,823						
Agriculture Teaching and Research Center Renovation/ Expansion	N/A	IB							PWC	34,319			E	1,961
Acker/Shurmer Gym Classroom/Faculty Office Renovation, Phase II	N/A	IB									PWC	57,389	E	1,348
Modoc II Classroom/Faculty Office and Laboratory Building	0	II									PWC	28,932	E	3,290
Totals $287,511	**31**			**$4,964**		**$49,625**		**$107,463**		**$34,319**		**$91,140**		**$6,599**

FTE represents the impact to Full Time Equivalent Student (FTES in the model) with increase or decrease associated with the new or remodeled facility.

Project Category (CAT):

Represents the type of project:

- Type I: Existing Facilities/Infrastructure
  - A: Critical Infrastructure Deficiencies
  - B: Modernization/Renovation
- Type II: New Facilities/Infrastructure

Project Costs

Projected costs are broken into four categories to coincide with the typical funding patterns of the CSU system:

P – Planning Funds
W – Working Drawings
C – Construction
E – Equipment

Appendix D: Total Cost of Ownership

Total Cost of Ownership

Current Year	2013	CRV ($/SF)	$300.00	Cap Ren /yr	$0.87
Expected Life	85	Building Cost ($/SF)	$350.00	Decommission	$60.61
Inflation	3.0%	Standard Rate /sf	$9.10	O&M per SF	$4.66
DM Accrual	1.18%	Max FCI	$0.55	Utilities per SF	$2.91

	Size	Built	Initial Project Costs*	Current Replacement Value	Yearly Operating Costs	Lifetime Operating Costs	Actual Operating Funds	Yearly Operating Cost Variance	Deferred Maintenance Accrual Yearly	Yearly Asset Renewal	Yearly Asset Renewal Variance	Total DM (3/13/13)	Projected Total DM at 85yr of Life	Max DM (0.55*CRV)	Decommission Costs	End of Life	Total Life Cycle Costs
ACKER GYMNASIUM	70,673	1961	$ 5,318,460	$ 21,201,900	$ 643,124	$ 54,665,566	$ 534,876	$ (108,248)	$ 249,434	$ 61,716	$ (187,718)	$ 6,004,698	$ 11,661,045	$ 11,661,045	$ 4,283,212	2046	$ 70,271,936
AYMER JAY HAMILTON BLDG.	36,857	1949	$ 1,945,385	$ 11,057,100	$ 335,399	$ 28,508,890	$ 278,946	$ (56,453)	$ 130,084	$ 32,186	$ (97,897)	$ 3,037,116	$ 6,081,405	$ 6,081,405	$ 2,233,758	2034	$ 35,725,149
AYRES HALL	45,803	1932	$ 1,462,671	$ 13,740,900	$ 416,807	$ 35,428,621	$ 346,652	$ (70,155)	$ 161,658	$ 39,998	$ (121,659)	$ 1,520,000	$ 2,006,637	$ 7,557,495	$ 2,775,939	2017	$ 41,187,231
BOILER-CHILLER PLANT	13,710	1970	$ 1,346,185	$ 4,113,000	$ 124,761	$ 10,604,685	$ 103,762	$ (20,999)	$ 48,388	$ 11,973	$ (36,416)	$ 921,093	$ 2,450,554	$ 2,262,150	$ 830,909	2055	$ 13,702,872
BUTTE HALL	88,874	1972	$ 9,257,987	$ 26,662,200	$ 808,753	$ 68,744,039	$ 672,627	$ (136,126)	$ 313,673	$ 77,611	$ (236,062)	$ 10,998,528	$ 14,664,210	$ 14,664,210	$ 5,386,303	2057	$ 94,386,857
FARM BUILDINGS	96,935	1963	$ 7,739,046	$ 29,080,500	$ 882,109	$ 74,979,223	$ 733,636	$ (148,473)	$ 342,124	$ 84,650	$ (257,473)	$ 3,187,665	$ 12,199,229	$ 15,994,275	$ 5,874,848	2048	$ 91,780,782
GLENN HALL	41,245	1959	$ 2,925,696	$ 12,373,500	$ 375,330	$ 31,903,008	$ 312,156	$ (63,174)	$ 145,571	$ 36,018	$ (109,553)	$ 4,173,345	$ 6,805,425	$ 6,805,425	$ 2,499,697	2044	$ 41,501,746
HOLT HALL	130,610	1972	$ 13,605,618	$ 39,183,000	$ 1,188,551	$ 101,026,835	$ 988,499	$ (200,052)	$ 460,976	$ 114,058	$ (346,919)	$ 19,930,449	$ 21,550,650	$ 21,550,650	$ 7,915,758	2057	$ 142,478,659
KENDALL HALL	51,232	1929	$ 1,497,209	$ 15,369,600	$ 466,211	$ 39,627,952	$ 387,740	$ (78,471)	$ 180,819	$ 44,739	$ (136,080)	$ 5,953,443	$ 8,453,280	$ 8,453,280	$ 3,104,970	2014	$ 50,183,574
LANGDON ENGINEERING CTR	58,249	1967	$ 5,234,126	$ 17,474,700	$ 530,066	$ 45,055,602	$ 440,847	$ (89,218)	$ 205,585	$ 50,867	$ (154,718)	$ 5,766,531	$ 9,611,085	$ 9,611,085	$ 3,530,242	2052	$ 59,586,501
LAXSON AUDITORIUM	33,092	1932	$ 1,056,759	$ 9,927,600	$ 301,137	$ 25,596,662	$ 250,451	$ (50,686)	$ 116,795	$ 28,898	$ (87,897)	$ 3,134,239	$ 5,460,180	$ 5,460,180	$ 2,005,576	2017	$ 31,793,235
MERIAM LIBRARY	269,018	1958	$ 18,526,869	$ 80,705,400	$ 2,448,064	$ 208,085,423	$ 2,036,016	$ (412,048)	$ 949,475	$ 234,925	$ (714,550)	$ 35,636,736	$ 44,387,970	$ 44,387,970	$ 16,304,121	2043	$ 278,553,149
MODOC HALL	35,225	1964	$ 2,896,643	$ 10,567,500	$ 320,548	$ 27,246,538	$ 266,594	$ (53,953)	$ 124,324	$ 30,761	$ (93,563)	$ 2,746,630	$ 5,812,125	$ 5,812,125	$ 2,134,848	2049	$ 35,024,659
O'CONNELL TECHNOLOGY CTR	75,683	1992	$ 14,239,170	$ 22,704,900	$ 688,715	$ 58,540,801	$ 572,794	$ (115,922)	$ 267,116	$ 66,092	$ (201,025)	$ -	$ 12,865,594	$ 12,487,695	$ 4,586,848	2077	$ 77,366,819
PERFORMING ARTS CENTER	111,132	1967	$ 9,986,075	$ 33,339,600	$ 1,011,301	$ 85,960,602	$ 841,083	$ (170,218)	$ 392,231	$ 97,048	$ (295,183)	$ 10,425,919	$ 18,336,780	$ 18,336,780	$ 6,735,273	2052	$ 113,107,869
PHYSICAL SCIENCE BLDG	84,814	1961	$ 6,382,633	$ 25,444,200	$ 771,807	$ 65,603,629	$ 641,900	$ (129,907)	$ 299,344	$ 74,065	$ (225,278)	$ 9,698,000	$ 13,994,310	$ 13,994,310	$ 5,140,242	2046	$ 86,824,505
PLUMAS HALL	64,015	1972	$ 6,668,430	$ 19,204,500	$ 582,537	$ 49,515,603	$ 484,486	$ (98,050)	$ 225,935	$ 55,902	$ (170,033)	$ 5,481,057	$ 10,562,475	$ 10,562,475	$ 3,879,697	2057	$ 65,544,786
SHURMER GYMNASIUM	24,305	1956	$ 1,577,763	$ 7,291,500	$ 221,176	$ 18,799,918	$ 183,948	$ (37,227)	$ 85,782	$ 21,225	$ (64,558)	$ 2,387,831	$ 4,010,325	$ 4,010,325	$ 1,473,030	2041	$ 24,238,543
SISKIYOU HALL	23,344	1957	$ 1,560,841	$ 7,003,200	$ 212,430	$ 18,056,584	$ 176,675	$ (35,755)	$ 82,391	$ 20,386	$ (62,005)	$ 1,695,097	$ 3,493,242	$ 3,851,760	$ 1,414,788	2042	$ 22,727,310
STUDENT HEALTH CENTER	22,296	1974	$ 2,464,014	$ 6,688,800	$ 202,894	$ 17,245,956	$ 168,743	$ (34,150)	$ 78,692	$ 19,470	$ (59,221)	$ 960,476	$ 3,684,659	$ 3,678,840	$ 1,351,273	2059	$ 22,021,719
STUDENT SERVICES CENTER	119,865	2008	$ 36,188,811	$ 35,959,500	$ 1,090,772	$ 92,715,578	$ 907,177	$ (183,594)	$ 423,053	$ 104,674	$ (318,379)	$ -	$ 25,470,290	$ 19,777,725	$ 7,264,545	2093	$ 136,168,934
TAYLOR HALL	33,108	1959	$ 2,348,502	$ 9,932,400	$ 301,283	$ 25,609,038	$ 250,572	$ (50,711)	$ 116,852	$ 28,912	$ (87,940)	$ -	$ 2,726,127	$ 5,462,820	$ 2,006,545	2044	$ 29,964,085
TEHAMA HALL	90,157	1992	$ 16,962,341	$ 27,047,100	$ 820,429	$ 69,736,440	$ 682,338	$ (138,091)	$ 318,201	$ 78,731	$ (239,470)	$ 109,337	$ 15,435,412	$ 14,875,905	$ 5,464,061	2077	$ 92,272,178
TRINITY HALL	26,817	1933	$ 882,064	$ 8,045,100	$ 244,035	$ 20,742,950	$ 202,960	$ (41,075)	$ 94,648	$ 23,418	$ (71,230)	$ 3,027,628	$ 4,424,805	$ 4,424,805	$ 1,625,273	2018	$ 26,277,915
YOLO HALL	70,626	2002	$ 17,857,604	$ 21,187,800	$ 642,697	$ 54,629,211	$ 534,521	$ (108,176)	$ 249,268	$ 61,675	$ (187,593)	$ -	$ 13,881,866	$ 11,653,290	$ 4,280,364	2087	$ 76,767,178
	1,717,685		$ 189,930,903	$ 515,305,500	$ 15,630,934	$ 1,328,629,348		$ (2,630,934)	$ 6,062,418		$ (4,562,418)	$ 136,795,818	$ 280,029,680				$ 1,759,458,189

*Initial Project Costs are estimated based on (Size x Building Cost x Inflation Adjustment).