



**EVALUATING THE FACILITIES PLANNING, DESIGN, AND CONSTRUCTION DEPARTMENT:
THE CAPITAL PROGRAMS MANAGEMENT AUDIT**

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In the life of an institution of higher learning, change is constant and inevitable. This is true in the case of its central teaching and research programs; in organizational, human resources, and other administrative matters; and, not least, in the institution's built environment. Planning, directing, and implementing change in the physical plant and campus environment (which we refer to as Capital Programs Management) is a complex undertaking for most institutions that is assigned, typically, to a Facilities Planning, Design, and Construction unit. To accomplish this work effectively and efficiently requires a well-organized and ably led staff; adequate in numbers, capabilities, and funding; with a clear and consistent approach to its work.

While the Facilities Planning, Design, and Construction unit often provides a variety of technical and other advisory services to an institution, including support to operations and maintenance, environmental health and safety, and Information Technology, capital program management is a substantial component of the unit's efforts. The following discussion presents a diagnostic model for assessing the state of an institution's capital programs management by delineating "work processes" which comprise that function.

WHAT IS CAPITAL PROGRAMS MANAGEMENT?

The APPA Manual for Plant Administration¹ provides the following definition of the Facility Planning, Design, and Construction (FPD&C) function:

A major grouping of functions normally included within a facilities management department, but sometimes organized separately from facilities operations and maintenance services, is facilities planning and programming for the institution, architectural and engineering planning of new construction, and construction project management. The principal functions include the following:

- *Facilities planning and administration*
 - *Facilities master planning*
 - *Space management and utilization*
 - *Capital program planning*
 - *Real estate management*
- *Architectural and engineering services*
 - *Design by staff or through architectural and engineering contracts*
 - *Architectural and engineering consulting services*
- *Construction contract administration*

While all of these functions are performed at all institutions of higher learning, organizational structures can vary by institutional size and cycle of capital programs development. Models can include in-house staffing with outsourcing of some responsibilities. On the very smallest campuses this work may be handled by one person or a small group. There the "work processes" often are simply embodied in the working patterns of these individuals, with little in the way of formal documentation. Once institutions

¹ APPA: The Association for Higher Education Facilities Officers. Facilities Management: A Manual for Plant Administration, Third Edition. Alexandria, Virginia, 1997. P. 51.

reach a threshold volume of capital programs activity a larger, more formal organization becomes necessary. With a sizeable staff comes the requirement for more formal, better-documented work processes.

The goal of an institution's capital programs is to maintain, over time, a proper alignment between its mission and programs and its built environment. This is done by periodically identifying the institution's physical plant requirements, and then adjusting the facilities portfolio to meet those requirements through an ongoing program of new construction, renovation, renewal of facility components and systems, decommissioning, and demolition. Proper management of capital programs by an FPD&C unit is critically important, first, to assure that suitable facilities of high quality are developed and second, to accomplish this task with a high degree of efficiency and effectiveness.

RESOURCES FOR CAPITAL PROGRAMS MANAGEMENT

We can think of Capital Programs Management in terms of applying the following five categories of resources to the functions included in the APPA Definition:

- Policy the institutional directives that drive planning, capital allocation, programming, and design decisions;
- Process the way in which management actions — planning and control — are clarified, routinized and documented;
- Tools the software and other job aids which organize information and serve as a record of decisions;
- Standards the rules and other adopted criteria that assure repeatability of processes and conformity with industry norms;
- People the professional abilities, experience, and organizational authority invested in the institution's staff driving the Capital Programs Management process.

A WORK PROCESS MODEL FOR CAPITAL PROGRAMS MANAGEMENT

Well directed, competent, and dedicated people are essential to a successful Capital Programs Management function, but the other four resource categories listed above are also necessary to give focus and consistency to the efforts of the FPD&C department. We have developed a *Work Process Model* for Capital Programs Management by an FPD&C function that portrays the interaction of the major functional elements of capital programs management (per the APPA Definition) with these resource categories.

The *Work Process Model* is depicted in Figure 1 in matrix form. The functions of Capital Programs Management managed by an FPD&C department are listed in the leftmost column and are organized into three major phases. These correspond with the logical and temporal sequence of actions involved in projects, from capital requirements definition to the activation of completed projects. The next columns correspond to the first four resource categories listed above. The personnel resource category is treated separately in Figure 2.

Figure 1: Capital Programs Management Processes				
FPD&C Phase Work Process	Institutional Policy Inputs to FPD&C	FPD&C Core Processes	Support Processes & Info. Systems	Quality Systems & Standards
Strategic Facility Planning Phase				
Space Planning & Management	<ul style="list-style-type: none"> Strategic (Business) Plan Space Allocation Policy 	<ul style="list-style-type: none"> Annual Space Inventory Space Needs Assessment & Periodic Updates Space Management Process 	<ul style="list-style-type: none"> Space Inventory Database 	<ul style="list-style-type: none"> Space Measurement Standards Space Planning Guidelines / Standards / Benchmarks
Capital Requirements Planning for Infrastructure / Renewal	<ul style="list-style-type: none"> Target Facility Condition Index (FCI) to be Achieved <i>in conjunction with</i> Capital Allocation Policy for Renewal / Refurbishment 	<ul style="list-style-type: none"> Periodic Facility Audits: <ul style="list-style-type: none"> Condition / life cycle replacement Code compliance Program Functionality Energy consumption 	<ul style="list-style-type: none"> Facility Audit — Condition / Quality Assessment Database Capital Plan / Budget Database 	<ul style="list-style-type: none"> Facility Audit Standards, Procedures, Inspection Cycle, etc. Adopted Industry References for Cost Estimating
Campus (Facility) Master Planning	<ul style="list-style-type: none"> Physical Development Policy 	<ul style="list-style-type: none"> Campus Master Planning & Periodic Updates 	<ul style="list-style-type: none"> FM Drawings in CAD 	<ul style="list-style-type: none"> Informal
Design Standards Program	<ul style="list-style-type: none"> Scope & Applicability of Standards Program 	<ul style="list-style-type: none"> Design Standards Development & Periodic Updates 		<ul style="list-style-type: none"> Informal
Management of Facility Documentation & Project Archives		<ul style="list-style-type: none"> Archiving of Project Documents & Records Maintenance & Update of Drawings in CAD 	<ul style="list-style-type: none"> FM Drawings in CAD (Project) Record Drawings in CAD File Indexing System for Project Records (Paper & Electronic Formats) 	<ul style="list-style-type: none"> CAD Standards
Capital Deployment Phase				
Planning Investigations & Feasibility / Programming Studies	<ul style="list-style-type: none"> Study Authorization & Funding Mechanisms 	<ul style="list-style-type: none"> Planning Investigation Request / Authorization Process Project Management Processes for Investigations / Feasibility / Programming Studies 	<ul style="list-style-type: none"> Project Management & Accounting Database Capital Plan / Budget Database 	<ul style="list-style-type: none"> Review / Screening Criteria (e.g., Institutional Policy, ROI) Project Budget & Schedule Templates (Concept-Stage) Space Planning Guidelines / Standards / Benchmarks
Annual Capital Budgeting Process & Ongoing Capital Plan Management	<ul style="list-style-type: none"> Capital Allocation Policy Program-based New Construction & Renovation Infrastructure / Capital Renewal Capital Contingency Allocations 	<ul style="list-style-type: none"> Annual Budget Development Process Budget Amendment Process Budget Management & Reporting 	<ul style="list-style-type: none"> Capital Plan / Budget Database 	<ul style="list-style-type: none"> Capital Budget Calendar, Forms, & Instructions Chart of Capital Accounts / C-I-P Accounts Status Reporting Formats & Schedules
Capital Project Implementation Planning / Initiation	<ul style="list-style-type: none"> Institutional Priority-Setting 	<ul style="list-style-type: none"> Capital Project Implementation Planning Assignment of Project Manager Scheduling & Prioritization Project Delivery Mechanism 	<ul style="list-style-type: none"> Capital Plan / Budget Database Project Management & Accounting Database 	<ul style="list-style-type: none"> Guidelines on Project Delivery Mechanism: <ul style="list-style-type: none"> Design Resources & Compensation A/E Service Contract Types Construction Contract Type Bidding / Negotiation Guidelines Detailed Project Budget & Schedule Templates

Figure 1 (continued): Capital Programs Management Processes

FPD&C Phase Work Process	Institutional Policy Inputs to FPDC	FPDC Core Processes	Support Processes & Info. Systems	Quality Systems & Standards
Project Execution Phase				
Vendor Pre-Qualification / Preferred Vendor Arrangements		• Vendor Pre-Qualification Process		• Vendor Pre-Qualification Standards
Project Team Selection		• Vendor Selection Process • Institutional Assignments / User Representatives		• Standard Professional Services Agreements, T&C's
Project Management:		• Detailed Project Schedule Management (throughout) • Project Documentation Processes (throughout) • Regulatory Interface (throughout) • User Interface (throughout) • Design Clarification / Request for Information Process (throughout) • Change Management Process (throughout) • Quality Assurance Processes	• Project Management & Accounting Database (throughout) • Project Records / Documentation Archiving System (throughout)	• Project Documentation Standards • Budget Performance Tracking & Accounting Standards • Schedule Performance Tracking • Project Correspondence • Meetings / Issue / Decision Tracking • Invoicing & Payment • File Indexing
• Pre-Design Services		• Planning & Programming Management Process	• Record Drawings of Existing Conditions (from Archive) • Existing Space Inventory Data	• Space Planning Guidelines / Standards / Benchmarks
• Design		• Design Management Process • Equipment Planning Management Process	• Record Drawings of Existing Conditions (from Archives)	• Design Standards • Design Review Process & Quality Standards
• Bidding / Negotiation	• Institutional Purchasing Policies	• Bidding / Negotiation Management Process		• Standard Contracts / Terms & Conditions / Scopes of Work
• Construction		• Construction Management Process		• Construction Observation Process & Quality Standards
• FF&E Procurement & Owner-Direct Contracts	• Institutional Purchasing Policies	• FF&E Procurement Management Process • Utilities Coordination • Procurement Logistics		• Standard Contracts / Terms & Conditions / Scopes of Work
• Close-out & Commissioning		• Project Close-out Process • Process for Turnover of Project Deliverables • To Project Archives • To O&M Staff • Commissioning Process		• Commissioning Plan / Guidelines

Phases & Work Processes

The initial phase, **Facility Strategic Planning**, relates overall institutional strategic and academic planning to the campus physical environment by formulating a physical development policy. Here the role of the Capital Programs Management (CPM) Office is to provide staff support to the institution's senior management and governing body, which are responsible for policy formation. The workload associated with this phase is rather predictable and independent of the level of current capital project activity. It is much more dependent on the size of the institution's physical plant and on its overall programmatic maturity — in an institution with growing enrollments or rapidly changing academic programs these facility strategic planning workloads will be correspondingly large. The major work processes of this phase are:

Space Planning & Management Physical plant and space requirements of the institution are matched, over time, to the available facilities portfolio through a formal process of space allocation. Space requirements in excess of the available portfolio will generate programs for new construction. Space requirements that are substantially less than the available portfolio imply decommissioning / adaptive reuse / demolition programs. The FPD&C Office provides staff support to this process.

Capital Requirements Planning The FPD&C Office identifies requirements for future capital outlays to renew and refurbish the institution's buildings and campus infrastructure. This should be done in a formal way through an ongoing Facility Audit process that examines each facility every three to five years.

Campus Master Planning The following campus elements are addressed for a five to ten year planning horizon: (1) land use and site planning, (2) design guidelines, (3) vehicular / pedestrian circulation and parking, and (4) infrastructure. Together, these elements set clear directions for the future development of facilities. Periodically, and preferably annually, the Campus Master Plan should be updated to reflect current conditions.

Design Standards Program Formal guidance in the form of Design standards, policies, and practices given to architects and engineers on materials, equipment, furnishings, etc. to be used in new construction and renovation projects. Factors influencing the specification of "campus standard" specifications may include preferred vendors or special pricing arrangements, life cycle cost, standardization of equipment to reduce maintenance costs, energy consumption guidelines, operational considerations, and campus aesthetics.

Facility Documentation / Archives Plans, specifications, and other reference materials relating to the physical plant are organized, indexed, and managed for use by future designers of campus improvements as well as by staff involved in ongoing maintenance & operations. The norm today is that drawings are maintained in the form of CAD files.

Next, the **Investigation & Capital Deployment** phase involves the identification, prioritizing, authorization, funding, and implementation planning of discrete capital projects, working from the framework of the institution's strategic or business plan and its Campus Master Plan. In the early part of this phase the FPD&C Office continues in its role as a staff to the institution's top management and governing body, facilitating their decision-making on capital allocations. At the end of this phase, after capital has been allocated to specific projects, the FPD&C Office organizes its own internal resources for implementation. This is done through the following major work processes:

Investigations / Feasibility Studies In the course of identifying potential capital projects, often the first step is to perform analyses or feasibility studies that help to define the problem to be solved via capital expenditure and contain recommendations for alternative operational solutions, project scope, preliminary cost estimates, and preliminary schedule projections. Typically this occurs before a proponent organizational unit decides to pursue funding of a specific capital

project. A funding source should be identified for the investigation process.

Capital Plan / Budget Management

A Capital Plan / Budget should be prepared and approved on an annual basis. In addition to newly proposed projects, the plan should include all active projects that are authorized and not yet completed. It should include information on project proponent / user, scope, budget, and schedule at a level of detail appropriate to the stage of the capital project. Newly proposed projects should appear in the Capital Plan / Budget as soon as they are sufficiently identified, even though they may not be required or funded for development for several years.

During a project's life it may be necessary to revise its scope, budget, or schedule. Also, from time to time, projects will be added to the Capital Plan / Budget outside of the annual cycle. Such amendments should be handled in a standard way. An emergent need for a capital project can arise due to unforeseen plant conditions or programmatic requirements. A pool of funds subject to the discretion of the Chief Facilities Officer may be available for such undesignated projects. Authorization for expenditure is provided by the Chief Financial Officer and is included in regular monthly and quarterly status reports along with other approved capital projects.

The FPD&C Office should manage the capital budgeting process, including such details as budget calendar, budget forms, etc., and should provide staff screening / review of all submitted projects.

Capital Project Implementation

An annual schedule that assigns project managers to specific projects and sets forth key milestones should be published soon after the annual capital budget is approved. At this initiation stage the contractual mechanism for delivering the project should also be decided upon, as it will influence the designer's scope of work and the level of detail required in construction documents. Criteria relating to the project's complexity, urgency, required quality level, and other factors should be used to determine project delivery method.

The third phase, **Project Execution**, covers the accomplishment of specific projects from start (an approved, scheduled, assigned project) to finish (a completed, occupied, operating project) and includes the following work elements:

Vendor Pre-Qualification Program

An important tool for managing project quality is the pre-qualification of design and construction firms based on objective criteria measuring firm capabilities, financial stability, and relevant past experience. The pre-qualification process may often be combined with or precede negotiation of vendor fees based upon guaranteed volumes of work for the vendor. Such preferred vendor arrangements often specify performance measurements and / or incentives to assure that quality is maintained.

Project Team Selection

The first step in project execution is the selection of the most appropriate team of vendors — planners, architects, engineers, and other design professionals, as well as construction managers and key materials / equipment / systems suppliers in some cases — for the project being initiated, in accordance with a FPD&C policy on vendor assignments. Policy will dictate that team members be drawn from pre-qualified vendors under normal circumstances. The goals of such policy should be to balance workloads with vendor resources, to capitalize on vendor familiarity with the nature of the project or highly relevant past vendor experience, etc.

Equally important at this stage is the formal assignment of “user representatives” for each project team. Again, overall project management policy should clearly define the roles and responsibilities of user representatives in such matters as pre-design and design quality reviews, management of change-orders and project contingency budgets, project close-out and acceptance, etc.

Project Management Processes

Throughout the complete life-cycle of a project — from pre-design & programming through design, bidding, construction, FF&E procurement, close-out, and commissioning — the assigned project manager is the central player responsible for the success of the project. Success is measured both in process measures (schedule and budget) and in outcome measures (project suitability and quality). The key project management processes are: project schedule management; project budget management; change management and decision documentation; regulatory interface; user interface; and quality assurance. Reasonably detailed project management policies and processes should be documented in a Project Management Manual.

Resource Categories

Institutional Policy Inputs to Capital Programs Management (CPM) are applicable only during the Strategic Planning and Capital Deployment phases. During the Project Execution phase there is normally no need for policy input at an institutional level although good practice would dictate a routine flow of information upwards on the status and progress of projects.

CPM Core Processes are the planning and control actions taken by the FPD&C Staff to further the accomplishment of its work. These should be clearly documented in reasonable detail in a CPM Manual. We have found that process flowcharting is a particularly effective documentation method.

Information Systems & Support Processes are the documentation and decision support systems that support CPM core planning and control processes. FPD&C offices handling a significant volume of capital programs activity should consider a suite of software applications. These include: (1) a Space Management / Space Inventory application; (2) a Condition Assessment database (which could be a module within a Computerized Maintenance Management System); (3) a Capital Plan / Budget database; (4) a CAD application for indexing and management of drawings and facility records; (5) a Project Management & Accounting workflow application. Staff productivity and communications among team members can be greatly enhanced through the use of workflow software, and particularly web-based products.

Quality Systems & Standards include a variety of reference materials, industry standards, and job aids such as forms and software templates. Such references contribute clarity and consistency to the CPM core processes and support processes, and this, in turn, helps to assure quality of outcomes.

HUMAN RESOURCES PROCESSES IN FACILITY PLANNING, DESIGN, AND CONSTRUCTION

Management of human resources within the FPD&C Office involves many of the same policies and practices as are applied throughout the rest of the institution. These are outlined in Figure 2 below. Although institutional policy governs in each of these areas, it is important for the FPD&C Office to incorporate its own special requirements while conforming to institutional norms.

One special area, impacting on both FPD&C personnel and budget policy, involves staff timekeeping and the proper allocation of time to projects. For capital projects, the institution may elect to charge project management services against project (capital) accounts, or it may elect to fund such project management out of the operating budget in order to extend scarce capital funds. By and large, Strategic Planning and Capital Deployment Phase activities must be funded out of the operating budget. Regardless of the funding strategy, good practice dictates capturing a detailed record of staff activity against specific work assignments, whether they be related to strategic planning, capital deployment, or project execution. Over time this data will be useful for estimating workloads and productivity, and thus to forecast the staffing requirements of the FPD&C Office.

Figure 2: Facility Planning, Design, and Construction Human Resources Processes	
Category	Sub-Category
Organization & Staffing	<ul style="list-style-type: none"> • Table of Organization • Position Descriptions • Workload Management
Performance Planning & Evaluation	<ul style="list-style-type: none"> • Annual (institutional) Process • Staff Performance Review • Post-Project Evaluations
Staff Training Program	<ul style="list-style-type: none"> • New Employee Orientation • CPM Policy & Procedures • Project Management Skills & Techniques • Technical Training • Skills Assessment
Timekeeping / Chargeback Policy & Process	

THE FACILITY PLANNING, DESIGN, AND CONSTRUCTION DEPARTMENT AUDIT

In auditing the FPD&C function, the CPM *Work Process Model* and *Personnel Process Model* have proven quite useful to assist an audit team in the following ways:

- At the FPD&C audit planning stage, the Models help to define the objectives and scope of the FPD&C audit when discussing the proposed engagement with the prospective client. Often there are nuances in the organization of the prospect’s capital programs activity which require that the assessor interact with several additional departments having minor or supporting roles in the overall CPM work process.
- In the initial stage of the audit, the Models provide a framework for identifying the policy and process documentation that the assessor must review. By reviewing the *Work Process Model* in detail the assessor and client can jointly develop a list of documents to be reviewed by the assessor in advance of the site visit.

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- During the interview stage, the *Work Process Model* is useful to match key personnel with functions so that all relevant FPD&C staff is interviewed. Previewing the *Work Process Model* in a general orientation at the start of the assessment, or with each interviewee individually, helps to set the agenda for the interview and focus the topics for discussion. This tends to streamline the interview process and eliminate redundant discussions.
 - At the analysis stage, the *Work Process Model* is a valuable diagnostic aid. We have found it useful to develop an assessment checklist from the *Work Process Model*, and to apply a simple point award scheme as a way to measure how well the FPD&C organization under study conforms to the *Work Process Model*. We have used the following four point rating scale to rate individual *Work Process Model* components:
 1. Excellent. All requirements met. No further review required.
 2. Good. Most requirements met. Future attention required for performance improvement.
 3. Fair. Partial meeting of requirements. Attention necessary for performance improvement.
 4. Poor. Requirements not met. Immediate attention required to achieve baseline performance.

By examining the pattern of scores awarded, it is possible to isolate the specific areas where attention is needed. We have observed patterns where a specific functional area (e.g., campus master planning) was deficient in an otherwise satisfactory FPD&C organization. We have observed other instances where a specific resource category (e.g., quality systems & standards) tends to be deficient across several functional areas.

APPLYING THE CPM PROCESS MODEL TO ASSESS A FPD&C OFFICE

The Work Process Model has been used as an assessment tool in several consulting engagements, three of which are summarized here:

CASE 1: Academic Health System

This large, urban academic health system with two hospital facilities and a network of ambulatory care sites sought an assessment of its Planning, Design, & Construction Office in advance of a major capital project. The system, which had been placing approximately \$20 to \$25 million in capital construction projects annually, was about to take on a \$105 million phased campus redevelopment program. The objective of the assessment was to identify what adjustments should be made to the PD&C Office in order to “scale up” for the larger program.

Using the *Work Process Model*, we found that the Strategic Facility Planning Phase suffered from deficiencies in documentation, so that the framework for evaluating potential capital projects was not clear to project proponents. This led to a resource-intensive, “ad-hoc” approach to capital project planning and budgeting. On the other hand, the Project Execution Phase was grounded in clear and consistent procedures with good documentation. Among the resource categories, we noted a serious lack of information systems support for all phases. We recommended the acquisition and implementation of commercial project management and accounting software to improve the productivity of the project management staff and to improve financial reporting and controls.

CASE 2: Public Research University

This comprehensive public research university, with a physical plant approaching 4.5 million GSF on a 350 acre campus and an enrollment of nearly 15,000, sought a “management efficiency review” of its Campus Development Office together with its Physical Plant Operations & Maintenance Office. This was one of a series of reviews of administrative and support functions within the university. The university sought recommendations on improvements in departmental operations and comparative external data on resource utilization, particularly manpower utilization.

Using the *Work Process Model* a set of recommendations was developed. It outlined changes in the overall conduct of the FPD&C unit to relinquish most design activities to consultants and to concentrate on capital program management, feasibility studies, and technical support to Physical Plant. An improvement in the interaction between the two departments was necessary to clarify roles and reduce customer concerns about sources of service.

CASE 3: Private College

A private residential Master's Comprehensive college with physical plant of 2.8 million gross square feet and an enrolment of 4,600 FTE students was concerned with the capabilities of its FPD&C and Physical Plant staff to handle current requirements and an expected 15% enrollment growth. In addition, there were senior management concerns about relations with the campus community and between the departments. A complication in the organizational structure was that the two departments reported to different vice presidents. The *Work Process Model* identified the need for a realignment of reporting lines to one vice president and the appointment of a Chief Facilities Officer to improve coordination between the two units. A major problem area in the processing of feasibility study requests and capital budget development was addressed with recommendations to modify institutional policies for identification of priority project requests. Other major recommendations were the reduction of construction work performed by in-house staff and introduction of capital project "chargebacks" to recover FPD&C costs directly from project budgets.

SUMMARY

The *Work Process Model* and *Human Resource Model* provide diagnostic tools to audit the effectiveness and efficiency of an institution's overall Capital Programs Management activities. The focus here on the Facilities Planning, Design, and Construction unit is designed to enable an audit team to look at the "big picture" and to identify problem areas that are suitable for improvement. Use of the *Models* should incorporate the full participation of the unit under review to encourage adoption of recommendations for improvements and to incorporate elements of the *Models* in routine work processes.

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