Business Consulting Services

# Smithsonian Institution
# Office of the Inspector General

## Project Management Review

## Patent Office Building
## Renovation Project



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# I. Executive Summary -
# A. Engagement Objectives and Scope

**The Office of the Inspector General (OIG) retained IBM Business Consulting Services (BCS) to conduct an independent project management review of the Patent Office Building (POB) renovation project.**

**BCS was asked to perform this project management assessment with the goal of:**

- Determining whether current project management controls are adequate to provide reasonable assurances that the POB project will be completed on time and within the established budget;
- Identifying potential project controls deficiencies contributing to project risks; and,
- Formulating specific suggestions for improved project management practices based upon current industry best practices.


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# I. Executive Summary – B. Report Structure

**The areas of investigation are organized into the three major components of capital program management.**

Best practice capital program delivery has efficient project management processes, well designed organizational structures, effective project accounting, leading technology, and performance-based management reporting.

## Project Management

Project Planning
Cost Control
Schedule Control
Client Management
Design Reviews
Change Order Management
Invoice Control
Filing and Document Control
QA/QC Program

## Organization

Project Resources
Policies and Procedures

## Project Accounting and Technology

Cost Tracking
Management Reporting
Web-based Collaboration Tools


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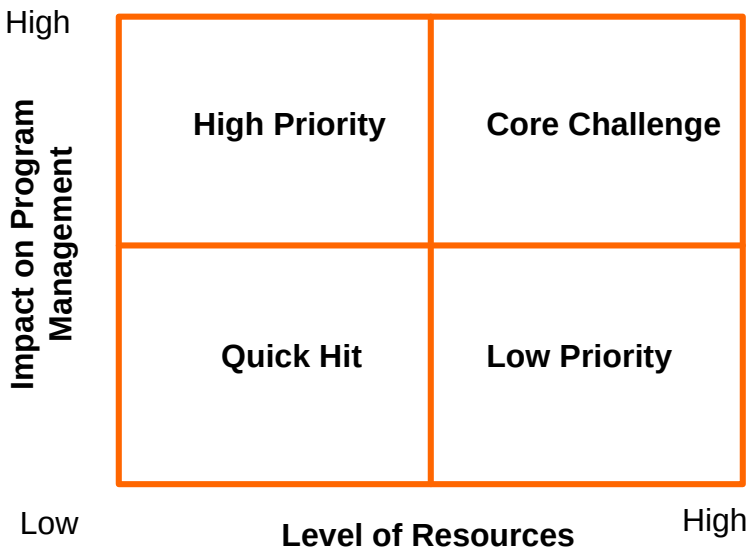
# I. Executive Summary – B. Report Structure (continued)

**The assessment of each topic area consists of Findings, Suggested Improvements / Best Practices, and Recommended Action Steps.**

The characteristics of these sections are outlined below:

- **Findings.** Findings consist of general comments and themes gathered from over fifteen interviews and a review of over twenty program documents.
- **Suggested Improvements/Best Practices.** Based upon the findings from the interviews, document review and industry experience, suggested improvements are outlined for the management of the POB project or for future similar projects. Where applicable to explain an improvement, templates and best practice examples are included.
- **Recommended Action Steps.** From the suggestions, specific potential action steps are outlined for the Smithsonian to consider. The potential action steps are assessed according to two criteria –impact on the management of the POB or similar project, and the level of necessary resources to implement.
  - **High Priority – High Impact/ Low Resources.** The best value action steps, these have high potential impact on overall program management, but do not require abundant resources to implement.
  - **Quick Hits – Low Impact/Low Resources.** Actions that take limited time, limited senior management involvement, and limited resources to implement, but singularly have limited impact on program management.
  - **Core Challenge – High Impact/High Resources.** Action steps that contribute greatly to improved program management, but require significant resource investment and senior management involvement.
  - **Low Priority – Low Impact/High Resources.** The least valuable action steps based upon impact on program management and level of resources to implement.





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# I. Executive Summary – C. POB Project Overview

**The Patent Office Building renovation project includes the repair or replacement of electrical and mechanical equipment, air distribution and control systems, exterior masonry, windows, elevators, and interior finishes.**

- The Patent Office Building is a National Historic Landmark. Construction of the 332,000 square-foot Patent Office Building was begun in 1836 and was completed in 1867. The building was converted to a museum in 1964. The Smithsonian American Art Museum and the National Portrait Gallery are housed in the building.
- The Patent Office Building project has been the subject of review by the National Academy of Public Administration for the U.S. Congress and as part of the budget process by the Office of Management and Budget.
- The Patent Office Building Project is part of the Repair, Restoration and Alterations Facilities Program (RR&A).

| | |
|---|---|
| **Project Scope** | ▪ The POB project, supported by a detailed Master Physical Plant Renewal Study, includes total restoration of the exterior masonry (including the windows), total interior historic renovation, and repair/replacement of electrical and mechanical equipment, air distribution and control systems that have exceeded their useful life and fail to comply with current codes and standards. This work is being managed by the Office of Facilities Engineering and Operations (OFEO). |
| **Project Budget** | ▪ The POB project has a budget of $166 million. In addition to the construction costs, this budget includes soft costs and the relocation costs for the staff and the art collections.<br>▪ This figure does not include the planned courtyard enclosure. The trust-funded enclosure project has not yet been designed and estimated and has not been officially authorized. The POB project budget also does not include the approximately $9 million roof repair project completed in 2000. |
| **Current Funding** | ▪ The project is funded with federal funds under the RR&A program.<br>▪ The project has received $48.6 million through Congress appropriations for the period FY 1996-2002. |
| **Schedule** | ▪ Construction activities are scheduled to be complete by the end of 2005 and the building is to be reopened to the public in July 2006. |


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# I. Executive Summary – D. Findings and Recommendations

**OFEO's project management controls for the POB project are generally effective; however, there exists both cost and project schedule risk exposures to the Smithsonian.**

**Financial Status**

- Based upon appropriated and obligated funding, the POB project is well underway. Through FY 2002, $48.6 M of the total expected $166 M in federal funding has been appropriated and obligated, representing approximately 30% of the total project budget.

**Schedule Status**

- The POB project schedule indicates that all renovation activities, including museum exhibit move-in, are to be completed for a July 2006 re-opening. The POB project schedule is contingent upon receiving 100% of the requested annual federal funding outlined in the OMB 300 submittal.

**The assessment of the management of the POB project identified areas of potential risk and outlined general areas of improvement.**

**Project Management**

- Even with adequate project controls in place, numerous museum requested changes throughout the planning and design phases of the POB project have resulted in redesign efforts that have extended the project schedule and increased the estimated costs.
- While the POB project now has a firm baseline budget from which project performance can be monitored, there is limited management of projected "forecast-to-complete" costs. As a result, there is risk that without changes in project scope and/or increased financial oversight the POB project may exceed the current project budget of $166 M.
- There is also risk that without receiving 100% of the requested annual federal funding as outlined in the OMB 300, that the projected July 2006 re-opening date may be unattainable. Additionally, there is limited management of a master project schedule within OFEO or the Smithsonian that coordinates construction activities and critical non-construction activities necessary to meet the project July 2006 re-opening date.


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# I. Executive Summary – D. Findings and Recommendations (continued)

**Project Management (continued)**

- OFEO's project management team is generally responsive to the construction project requirements of the National Portrait Gallery and the American Art Museum; however, within the Smithsonian there is limited overarching project management of non-construction project requirements that take into account other Smithsonian constituencies.
- Project stakeholders are provided the opportunity to review the project documents through a formal design review process known as the SD 410 process.
- There are many key elements of a solid change order review process in place within OFEO; however, the process may benefit from an ongoing construction audit program.
- The invoice and fund control processes are effectively managed by OFEO and O-Con personnel.
- The existing project filing system is efficient and the Smithsonian is considering using an electronic system to enhance the filing and document control process.
- The QA/QC program contains good quality control elements such as contractor's quality control plan submitted prior to starting construction and regular on-site inspections.

**Organization**

- While the framework for project management within OFEO is considered a best practice, planned project management staffing levels for the POB may be inadequate to fully execute the oversight activities of the remaining work.
- The recently published Facilities Project Management Handbook will serve as an excellent source of information to project participants on project roles, approval processes, and performance measurement.

**Project Accounting and Technology**

- The existing PFITS cost accounting system is effective in tracking the POB project execution costs managed by OFEO. Further creation of standardized reports and the planned integration of disparate budget and execution systems will improve overall project management for the POB project and future projects.
- There are limited financial management reports that highlight the health of the POB project in terms of performance metrics, planned vs. actual costs, and schedule updates. Further investigation into key performance indicators and project reporting templates will benefit the management of the POB project.


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# I. Executive Summary – D. Findings and Recommendations (continued)

**Potential action steps addressing the suggested improvements of the report have been outlined for the Smithsonian's consideration. These action steps have been rated according to their potential impact on program management and the perceived level of resources to implement.**

**"High Priority" – High Impact/ Low Resources**

**Cost Control.** Monitor contingency usage against percent completion for cost control performance.

**Schedule Control**. Increase construction oversight of schedule reporting for contract compliance.

**Client Management.** Establish a higher level of project oversight to ensure all Smithsonian project issues are addressed.

**Project Resources.** Evaluate the current relationships between planned capital expenditures and operating budget to identify project management resource requirements over the next five years.

**Policies and Procedures.** Continue to monitor the development of the new Facilities Project Management Handbook and ensure it is implemented on the remainder of the POB project.

**Management Reporting.** Study project management reporting requirements.

**Collaboration Tools.** Study the benefits of using web-based collaboration tools.

**"Quick Hits" – Low Impact/ Low Resources**

**Cost Control.** Establish "audit trail" documentation for all changes to the baseline budget.

**Cost Control.** Establish a standardized format for cost estimates that is inclusive of all known costs.

**Cost Control.** Manage separate budgets and contingencies for each individual project contract.

**Schedule Control.** Increase the responsibility of the contractor in regard to schedule reporting.

**Client Management.** Ensure that the A/E receive instructions only from OFEO.

**Change Order Management.** Establish a construction audit program tailored to the specific needs of construction projects.

**"Core Challenge" – High Impact/ High Resources**

**Cost Tracking.** Study cost tracking requirements of future programs and the ability of existing systems to meet these requirements.

**Management Reporting.** Develop Earned Value metrics to aid in determining the schedule and cost positions of projects.

**"Low Priority" – Low Impact/ High Resources - None**


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# II. Project Status – A. Financial

**Based upon appropriated and obligated funding, the POB project is well underway. Through FY 2002, $48.6M of the total expected $166M in federal funding has been appropriated and obligated, representing approximately 30% of the total project budget.**

- **The POB project's current budget is $166M.** This figure does not include the planned courtyard enclosure enclosure. The trust-funded enclosure project has not yet been designed and estimated and has not been officially authorized. The POB project budget also does not include the approximately $9M roof repair project completed in 2000.
- **The POB project's current budget of $166 M is supported by the latest OMB 300 submittal.** The OMB 300 submittal outlines the required annual federal funding requirements to meet the expected completion date of July 2006. It also itemizes the total $166 M budget request by major project cost category. The OMB 300 does not , however, itemize annual funding requirements by major project cost category.

**Figure 1 – OMB Budget by Major Project Cost Category**

- This figure illustrates the breakdown of the $166 M project budget by the major project cost categories.

| Major Project Cost Categories | FY04 Budget to OMB ($M) |
|---|---|
| Planning/Design | $14.7 |
| Construction | $123.5 |
| Contingency (12.5%) | $15.5 |
| Construction Management (8%) | $11.0 |
| Building Commissioning (1%) | $1.3 |
| **Totals** | **$166.0** |

**Figure 2 – Obligated and Planned Annual Funding Requirements**

- This figure illustrates that based upon obligated funding through FY02 the POB project is approximately 30% complete.

| Fiscal Year | Obligated Funding ($M) | Planned Funding ($M) | Total Funding ($M) |
|---|---|---|---|
| FY 96-00 | $16.6 | | $16.6 |
| FY 01 | $17.0 | | $17.0 |
| FY 02 | $15.0 | | $15.0 |
| FY 03 | | $25.0 | $25.0 |
| FY 04 | | $48.0 | $48.0 |
| FY 05 | | $44.4 | $44.4 |
| **Totals** | **$48.6** | **$117.4** | **$166.0** |
| **Percent of Budget** | **29%** | **71%** | **100%** |

- **During this assessment, Federal FY03 funding for the POB project of $25.0M was approved.** The remaining planned federal funding for the POB project is now $92.4M - $48.0M in FY04 and and $44.4M in FY05


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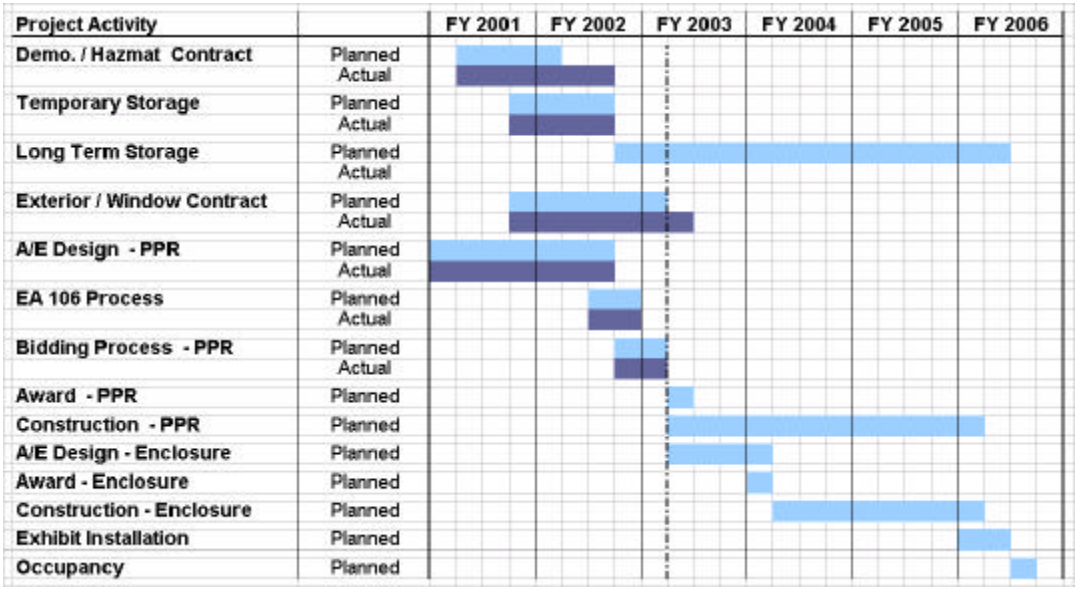
# II. Project Status – B. Schedule

**The POB project schedule indicates that all renovation activities, including museum exhibit move-in, are to be completed for a July 2006 re-opening.**

- **The POB project schedule is contingent upon receiving 100% of the requested annual federal funding outlined in the OMB 300 document.** Any annual appropriation over the remaining years of the project less than the Smithsonian's requested amount could impact the project schedule and the project cost.
- **The POB project is being procured through three construction contracts.** The construction of the POB project has been separated into three distinct construction contracts – Demolition/ Hazmat Abatement, Exterior Stone and Window Restoration, and the Physical Plant Renewal (PPR).
- **Design for all three contracts has been completed.**

**Figure 3 – POB Project Schedule**

- This figure illustrates the planned and actual schedules for the major project activities.





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# III. Project Management – A. Project Planning

**Even with adequate project controls in place, numerous museum requested changes throughout the planning and design phases of the POB project have resulted in redesign efforts and have extended the project schedule and increased the estimated costs.**

**Findings**

- **Project planning and project approvals follow a proscribed process.** The required project and project change approvals from various committees – such as the oversight committee and the capital planning board - establish a high level of project control.
- **Project control processes and procedures are adequate and in place to oversee the management of the POB project.** However, individual project decisions, both past and future, while made within the framework of the project planning and project approval processes, have significant impact on the successful delivery of the POB project in regard to schedule and cost.
- **The POB project has experienced significant " scope creep" mainly driven by the museum tenants.** System failures and non-compliance with building codes endangering public safety provided the support for the initial POB project scope. Further investigation into how systems were to be replaced within an historic structure resulted in several programmatic changes during the design process. While changes such as this are expected to be made during the design schematic phase, many scope changes, mainly driven by the museums, occurred late in the design development process. Below are two of the scope changes that occurred after Hartman-Cox Architects submitted the original design in September 1997 that dramatically impacted the project scope and project schedule:
  - In **April 1998,** management decided to eliminate all offices and non exhibition space, to permanently relocate the Archive of American Art, to design the renovation in a vacant building, and to include a Central Plant. As a result the program was revised and a new design was developed.
  - Before the submission of the final drawings in May 2000, senior Smithsonian leadership expressed interest in exploring an enclosure for the courtyard and the reconstruction of the entry steps to the South Portico. A month later the architects were asked to develop alternatives for a 350 seat auditorium below the courtyard as part of the Physical Plant Renewal (PPR) project. As a result of the new PPR programmatic elements, a notice to proceed was issued on **February 2001** to redesign the PPR project to incorporate a below-grade courtyard auditorium and allow for the future courtyard enclosure.
- **The POB project has experiences delays and cost impacts.** Major museum requested changes during the design phase of the POB project have necessitated rework and additional A/E services, which both have delayed the project and increased the cost of the project.


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# III. Project Management – A. Project Planning (continued)

## Suggested Improvements/ Best Practices

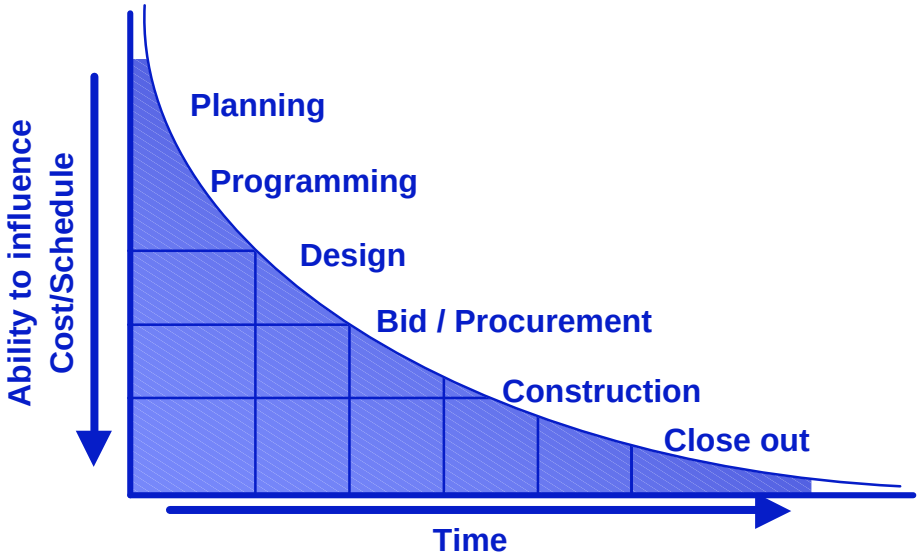
- **Recognize that the ability to control project costs and schedule decrease dramatically as the project moves forward.**
- **Define criteria outlining what constitutes schematic design, design development and construction document completion.** Ensure that design moves from one phase to another with the full understanding of the project stakeholders, reducing the risk of programming changes later in the design process and increasing the confidence level of intermediate cost estimates.

## Recommended Action Steps

- **There are no specific action steps to consider.**

**Figure 4 – Ability to Influence Cost and Schedule**

- This figure illustrates the ability to control project costs and schedule decreases dramatically as the project moves forward through the project lifecycle.





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# III. Project Management – B. Cost Control

**While the POB project now has a firm baseline budget from which project performance can be monitored, there is limited management of projected "forecast-to-complete" costs and contingency funds. As a result, there is risk that without changes in project scope and/or increased financial oversight the POB project may exceed the current project budget of $166 M.**

**Cost Control findings are organized into three areas:**

- Capital Budgeting
- Cost Estimating
- Contingency Management

## Findings - Capital Budgeting

- **There does not appear to be a "baseline project budget".** While the overall project budget is now established, the budget components do not appear to be frozen, but rather updated during the life of the project, making internal control against a baseline difficult to achieve.
- **There is limited background information supporting the most recent request to Congress for federal funding**. While an official budget (Exhibit 300) has been produced for Congress appropriations, there is little supporting documentation for the estimated construction costs.
- **Recent project budgets in the Monthly Issues Report exceed $166 M.** Recent project budgets in the Monthly Issues Report indicate that obligated funding through FY 02 plus the estimated remaining balance for FY 03-05 exceeds $166 M. Within this reported project budget, it appears that the bottom line project budget of $166 M has been kept constant since the Critical Assessment, with modifications at the line item level occurring with limited supporting documentation.


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# III. Project Management – B. Cost Control (continued)

## Suggested Improvements / Best Practices – Capital Budgeting

- **Develop and monitor budget performance against "baseline" budgets.** The Smithsonian should consider maintaining a baseline budget, established when the project scope has stabilized, from which subsequent budget and project performance could be monitored. It should include all construction and non-construction activities.
- **Include more soft costs in project budgets.** The Smithsonian should consider developing a procedure for budgeting soft costs to ensure that the budget comprises all project costs along with the construction costs. Soft costs are to be listed by categories and fixed budgeting percentages applied. Aside from A/E and CM costs, there can be additional costs for advertising, permitting, environmental, legal, PMO and other cost allocations.
- **Manage budget categories according to federal funding requests.** The Smithsonian should consider developing an annual project budget in accordance with the major cost categories reported in the OMB 300 submittal.

## Recommended Action Steps – Capital Budgeting

1. **Establish "audit trail" documentation for all changes to the baseline budget.**
   - While unforeseen or uncontrollable circumstances may arise and impact the project budget, any budget modification should be adequately documented and a full audit trail created showing all variances and line item transfers, allowing for reconciliation to the original project budget and detailing the use of design and construction contingency. Reconciliation reports should report both variances between Construction Manager estimates and check estimates, and variances from prior estimates. This level of documentation will require input from OFEO and the Museums.
   - **This is a "quick hit" – a low impact/low resource action.**


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# III. Project Management – B. Cost Control (continued)

## Findings – Cost Estimating

- **There was limited cost reconciliation during the design phase of the POB project.** While cost estimates were compiled during the design phase at major design milestones, there is limited documentation supporting that cost reconciliation was performed to ensure full explanation of variances and line item transfers. Although a cost variance analysis was performed for the PPR project at 100% submission between the two independent estimates, no reconciliation of the estimates developed at 100% and 70% was performed. Full estimate reconciliation ensures a full understanding of the changes that have occurred such as scope changes or new funding requirements.
- **Format inconsistencies appear between estimates.** Cost estimates produced by the same estimating firm have inconsistent cost breakdown structures, making reconciliation between estimates difficult to achieve.
- **Soft costs have not always been included in the project cost estimate, and soft costs assumptions are not clearly outlined.**
- **For the POB project, there was limited in-house capabilities for cost estimating.** Cost estimates for the POB project were generally performed by independent consultants; however, a cost engineering division within OFEO with four staff and one chief estimator is in the planning stages. An internal cost estimating division, ensuring a more integrated approach to cost estimating, is common among organizations with large capital programs.

## Suggested Improvements/ Best Practices – Cost Estimating

- **Cost estimates should have standard formats and should be inclusive of all known costs.** Cost estimates should capture all project costs including contingencies, soft costs, and other costs applied to the project, and should have a consistent format to ensure streamlined reconciliation process.
- **Cost estimates should be periodically updated.** Cost estimates should be compiled during the design phase at regular intervals to ensure that the design documents are being developed in accordance with the approved budget. Cost estimates performed only at major design milestones may result in extensive redesign time if over-budget.
- **The Smithsonian should consider using "check" estimates and contractor price validation to ensure that cost estimates provided by the same cost management firm are adjusted to reflect current market conditions.**
- **Changes to the cost estimates should be clearly documented.** Documentation that outlines estimate reconciliations, why estimates have changed, and reporting variances from prior estimate should be maintained.


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# III. Project Management – B. Cost Control (continued)

## Recommended Action Steps – Cost Estimating

2. **Establish a standardized format for cost estimates that is inclusive of all known costs.**
   - Cost estimate format should be standardized to allow for true comparison between estimates and to increase the level of confidence that all project costs are accounted for. In particular, soft costs should be determined along with the construction cost to serve as accurate depiction of total project costs. The responsibility for generating this list of all known costs does not reside solely in OFEO. Museum collaboration will be required to complete this action step.
   - **This is a "quick hit" – a low impact/low resource action.**

## Findings – Contingency Management

- **A FTC based upon actual obligations thru FY 02 and cost estimates for all remaining work compares reported budget figures to projected completion costs.** The following slide shows a chart that details how the projected completion costs were derived based upon the following assumptions:
  - OMB 300 budget figures are those in the Capital Asset Plan submitted to the Congress for the FY 2004 budget. Those figures are presented by main project cost categories, including design, construction, contingency, construction management, and commissioning
  - The construction costs are made of five major elements: the Gross Demolition project, the Window Restoration project, the PPR project, Art Storage, and Cost of Completion
  - The project costs to date are the obligations thru FY 02
  - The forecast of the PPR project cost is based upon 100% Submission issued September 2002 and assumes no allowance for construction change orders and time extension
  - The present evaluation of the projected completion costs is as of March 2003 and includes information provided by OFEO after the project management review was performed and for which IBM did not take action.


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# III. Project Management – B. Cost Control (continued)

## Findings – Contingency Management (continued)

**Figure 5 - Forecast-to-Complete Analysis**

- The forecast-to-complete analysis below outlines the **Total Project Costs before Contingency** by major project cost category.

| Major Project Cost Categories | OMB 300 Capital Asset Plan | Obligated Thru FY02 | Additional Foreacast-to-Complete | Forecast-to-Complete at Completion | Variance | Percentage Variance (Variance/OBM 300) |
|---|---|---|---|---|---|---|
| **Design Projects** | | | | | | |
| A/E design fees | $14,700,000 | $14,277,393 | $0 | $14,277,393 | $422,607 | 2.9% |
| **Total Design Costs** | **$14,700,000** | **$14,277,393** | **$0** | **$14,277,393** | **$422,607** | **2.9%** |
| | | | | | | |
| **Construction Projects** | | | | | | |
| Art Storage | $7,000,000 | $9,602,510 | $372,796 | $9,975,306 | ($2,975,306) | -42.5% |
| Demolition Contract | $7,300,000 | $9,113,000 | $192,000 | $9,305,000 | ($2,005,000) | -27.5% |
| Window Restoration Contract | $5,700,000 | $9,334,000 | $300,000 | $9,634,000 | ($3,934,000) | -69.0% |
| PPR (interior renovation contract) | $95,000,000 | $159,000 | $95,454,486 | $95,613,486 | ($613,486) | -0.6% |
| Cost to Complete (museum interior finishing) | $8,500,000 | $0 | $7,870,370 | $7,870,370 | $629,630 | 7.4% |
| **Total Construction Costs** | **$123,500,000** | **$28,208,510** | **$104,189,652** | **$132,398,162** | **($8,898,162)** | **-7.2%** |
| | | | | | | |
| Engineering during Construction | $0 | $241,612 | $2,175,658 | $2,417,270 | ($2,417,270) | |
| Construction Management | $11,000,000 | $5,197,368 | $2,475,839 | $7,673,207 | $3,326,793 | 30.2% |
| **Total Construction Management Costs** | $11,000,000 | $5,438,980 | $4,651,497 | $10,090,477 | $909,523 | **8.3%** |
| | | | | | | |
| Building Commissioning | $1,300,000 | $0 | $0 | $0 | $1,300,000 | 100.0% |
| **Total Building Commissioning Costs** | $1,300,000 | $0 | $0 | $0 | **$1,300,000** | **100.0%** |
| | | | | | | |
| **Total Project Costs before Contingency** | **$150,500,000** | **$47,924,883** | **$108,841,149** | **$156,766,032** | **($6,266,032)** | **-4.2%** |
| | | | | | | |
| Project Contingency | $15,500,000 | $0 | $0 | $0 | $15,500,000 | 100.0% |
| | | | | | | |
| Balance | $0 | $675,118 | $0 | $675,118 | ($675,118) | |
| | | | | | | |
| **Total Project Costs** | **$166,000,000** | **$48,600,001** | **$108,841,149** | **$157,441,150** | **$8,558,850** | **5.2%** |


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# III. Project Management – B. Cost Control (continued)

**Findings – Contingency Management**

- **As illustrated in the FTC, it appears that through FY02 $8.0 M of the budgeted $15.5 M in contingency funding has been liquidated.** These funds were used for demolition and restoration change orders and art storage costs beyond contract amounts and represent 52% of the total contingency funding for the project as reported in the OMB 300 document.
- **The demolition and restoration projects are over budget.** The variance column indicates the variance between the recently reported OMB 300 budget and the actual or expected forecast-to-complete cost and this variance is to be understood as project contingency. Actual variances for the demolition and restoration projects that amount to $5.5 M represent 30% of the obligated $18.5 M construction cost for these contracts. The $5.5 M in variances for these contracts account for 68% of the contingency funding used to date (the $8.0 M to cover these two contracts, and art storage costs).
- **There is limited management and reporting of the contingency usage.** There does not appear to be monitoring of contingency draw downs against percentage completion. While 52% of the contingency funding appears to be liquidated, only 30% ($48.6 M divided by $166.0 M) of the total project costs have been obligated. The use of contingency funding for the two existing contracts is not clearly documented.
- **There is a risk that there will be limited contingency funding remaining to realistically manage construction change orders on the PPR project and the Cost to Completion project.** The $8.6 M left in the contingency represents only 7.9% of the remaining project cost, and is set aside for a major construction project that has yet to commence.


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# III. Project Management – B. Cost Control (continued)

## Suggested Improvements/ Best Practices – Contingency Management

- **Actively monitor contingency spending.** Contingency usage is expected, but the proportion of that usage compared to the percent complete is a measure of current project financial performance. Significant allocation of contingency early in a project may be a signal of design or construction issues and indicate a potential budget overrun.
- **Actively manage contingency funding by major category.** Managing and reporting on multiple contingency categories, as illustrated below, provides a clearer picture of project cost performance. Liquidation of specific contingency funding may indicate project areas that require further attention.

**Figure 6 – Contingency Budget Categories**

- This figure outlines four distinct and separate contingency sub-funds that can assist the Smithsonian project teams with contingency management on future projects.

### Illustrative Contingency Budget Categories

Make use of separate contingency pots to ease project monitoring and establish contingency allocation guidelines.

- **Soft Costs** - an allowance used during the design phase to fund supplemental work carried out by the design team as a result of unforeseen circumstances.
- **Construction** - allowance for change orders to the construction contract due to unforeseen field conditions and interference issues that could not have been reasonably anticipated.
- **Owner** - amount is reserved for use by Smithsonian to increase project scope, or modify a project's function beyond what was approved in the baseline budget.
- **Market** - an allowance used to buffer the project against cost increases due to adverse market conditions or expected project delays.


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# III. Project Management – B. Cost Control (continued)

**Recommended Action Steps – Contingency Management**

3. **Monitor contingency usage against percent completion.**
   - OFEO should consider monitoring contingency spending against the percent complete to ensure potential budget overruns be identified early in the project to take appropriate management actions.
   - The outcome should be a Key Performance Indicator (KPI) to measure the current financial health of a project and the effectiveness of project management oversight.
   - **This is a "high priority" – a high impact/low resource action.**

4. **Manage separate budgets and contingencies for each individual project contract.**
   - OFEO and the Museums together should consider developing separate budgets for each project contract to ensure a better control at the project level and increase budget accountability.
   - The outcome should be separate project budget for each contract with the associated soft costs and contingencies.
   - **This is a "quick hit" – a low impact/low resource action.**


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# III. Project Management – C. Schedule Control

**There is risk that without receiving 100% of the requested annual federal funding as outlined in the OMB 300, the projected July 2006 re-opening date may be unattainable. There is limited management of a master project schedule by the Museums and OFEO that coordinates construction activities and critical non-construction activities necessary to meet the project July 2006 re-opening date.**

## Findings

- **The project schedule is based solely upon receiving 100% of the requested annual federal funding.** There does not appear to be a contingency plan or financial commitment on behalf of the Smithsonian for meeting the July 4, 2006 re-opening date should the annual federal funding appropriations be less than requested. Additionally, should the July 4, 2006 date be delayed due to annual federal funding appropriations, project costs will likely increase due re-phasing of construction activities to match annual appropriations.
- **A master project schedule that coordinates construction and non-construction activities is currently being developed.** While recent attempts to organize a team to set out all the tasks and timeframes for the completion of the POB project have been made, a formal document showing all construction and non-construction activities is yet to be developed.
- **Based upon a high level review of the project construction schedule, there may be insufficient time between construction completion and the July 4, 2006 re-opening date to allow for museum exhibition construction, art installation, and operational training.** The October 2002 project schedule in the Monthly Issues Report outlines the following "early finish" activities and dates:
  - Courtyard Enclosure – March 10, 2006. This enclosure project is yet to be designed, estimated, or authorized.
  - Basement – March 21, 2006.
  - Third and Fourth Floors, South – March 9, 2006.

  These construction activities have impact on the final occupancy certification of the facility and may impact final temperature and humidity control requirements. The early finish delivery of these construction activities is approximately fourteen weeks prior to the planned re-opening.
- **Baseline and progress schedules are not cost loaded.** It is expected that a project of this magnitude would have a cost loaded schedule allowing the Smithsonian to manage cash flow requirements and cost impact of changes to projected draw downs. With a cost loaded schedule cash flow projections can be maintained on a monthly basis and monitoring against projected draw downs better managed.
- **Progress schedules do not contain the baselines of the original and previous schedules.** With no time reference it is difficult to assess field performance with the established schedule and identify activities that require recovery actions.
- **Progress schedules do not contain completed activities.** It is expected that progress schedules report on all project related activities including completed activities and percent-complete of active activities.


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# III. Project Management – C. Schedule Control (continued)

## Findings (continued)

- **Contractors fail to comply with certain contract reporting requirements.** While the contract specifications for Construction Progress Documentation contain specific reporting requirements such as CPM reports, it appears that construction contractors fail to comply with those requirements.

## Suggested Improvements / Best Practices

- **Consider ensuring full compliance of contract terms and conditions.** The construction COTR should enforce existing contract clauses and ensure that construction contractors fully comply with progress reporting requirements.
- **Consider requiring construction contractors to provide cost loaded progress schedules to ensure that cash flow requirements are met and funding is properly controlled.**
- **Consider requiring planned vs. actual construction project schedules from the contractor.** The General Conditions of the PPR Project does not explicitly require this schedule submittal.

## Recommended Action Steps

5. **Increase the responsibility of the contractor in regard to schedule reporting.**
   - Consider requiring the contractor to provide planned vs. actual construction project schedules, and cost loaded progress schedules.
   - The outcome should be contract language that clearly requires planned vs. actual schedules and cost loaded progress schedules from the contractor.
   - **This is a "quick hit" – a low impact/low resource action.**

6. **Increase construction oversight of schedule reporting.**
   - Consider requiring the contractor to provide all construction progress documents in compliance with the construction contract to ensure timely and accurate management decisions.
   - **This is a "high priority" – a high impact/low resource action.**


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# III. Project Management – D. Client Management

**OFEO's project management team is generally responsive to the construction project requirements of the National Portrait Gallery and the American Art Museum; however, within the Smithsonian there is limited overarching project management of non-construction related project requirements that take into account other Smithsonian constituencies.**

## Findings

- **The addition of a POB project Manager outside OFEO has been beneficial to the museums.** This position serves as "owner representative" to the Museums and single point of contact, attending all key meetings, and communicating project status and outstanding issues to the museum directors.
- **The architect of the POB project appears to have multiple clients.** As COTR of the A/E contract, OFEO is clearly the client of the architect, and is responsible for the delivery of the POB project. However, because of the programmatic input and the museums' involvement in design issues, the architect may also see the Museums as clients. The control of the architect requires further attention at the Oversight Committee level.
- **The single OFEO Project Executive position may be insufficient to manage the successful delivery of the POB project.** The OFEO Project Executive position is responsible for delivering the construction project on time and on budget, and OFEO is well equipped to support this role to this end. However, the POB is a complex project which includes multiple clients, a grand re-opening of two museums, and private donations, in addition to the construction restoration of the facility. It may require a higher level of oversight beyond the Project Executive role, focusing on all Smithsonian constituencies, to ensure a successful delivery to the entire Smithsonian community.

## Recommended Action Steps

7. **Ensure that the A/E receive instructions only from OFEO.**
   - Consider communicating to all project stakeholders that all design requests should be addressed to OFEO and that no direct instructions should be given to the A/E.
   - Consider informing the A/E that all requests not issued by OFEO should be declined.
   - **This is a "quick hit" – a low impact/low resource action.**

8. **Establish a higher level of project oversight to ensure all Smithsonian project issues are addressed and all Smithsonian stakeholder input is considered.**
   - **This is a "high priority" – a high impact/low resource action.**


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# III. Project Management – E. Design Reviews

**Project stakeholders are provided the opportunity to review the project documents through a formal design review process known as the SD 410 process.**

## Findings

- **The importance of the design review process is recognized.** The Smithsonian has instituted a formal process, known as the SD 410 process, that obtains inputs from all project stakeholders during the design phase through a user-friendly web-based system (eMarc) and ensures that the design documents are fully analyzed prior to authorization for bidding.
- **Many key elements of a good design review process are followed.** The SD 410 process contains many industry best practices elements such as mandatory review periods at major key design milestones, review comments tracking using a web-based system and a record of issues established.
- **There is a formalized process in place to ensure that all design review comments are considered by the design team.** The A/E firm is contracted to respond to each and every design review comment. However, the process ensuring that drawings have been modified accordingly and changes incorporate into revised design documents is not documented.
- **Constructibility reviews are performed.** The construction management team is involved in the design review process and provides comments on issues related to construction feasibility.

## Suggested Improvements/ Best Practices

- **Continue utilizing design review conferences when applicable.** To improve the speed of design reviews, continue to schedule one-day design review conferences to gather all stakeholder comments.
- **Schedule design review time into the CM project schedule.** Design review time should be made part of the critical path to highlight its importance to the project team.

## Recommended Action Steps

- **There are no specific action steps to consider.**


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# III. Project Management – F. Change Order Management

**There are many key elements of a solid change order review process are in place; however, the process may benefit from an ongoing construction audit program.**

**Findings**

- **Independent estimates of change order prices are performed.** The process of producing independent cost estimates is recognized as critical to the change order review process. Independent cost estimates are produced by the CM firm to check pricing and scope on change order work. They are also used during the negotiating process with the contractor.
- **There is a formalized process for change order negotiation.** Change orders are negotiated with the contractor with the support of the CM firm that has prepared the independent estimate. As a result, a pre-negotiation memorandum is issued by the Office of Engineering and Construction authorizing the work to commence in the field.
- **Change orders are authorized before a formal contract modification is issued by O-Con.** A pre-negotiation sheet that contains the negotiated prices agreed upon by the contractor is used in-lieu of a formal contract amendment to authorize the work in the field.
- **Reasons for changes are tracked.** The underlying reasons for change orders, such as unknown conditions, client request, SI requirements, and design deficiencies are tracked. However, the associated cost breakdown by reason code is not recorded.
- **The change order format includes important elements.** Important information such as reason code classification, work description, and cumulative amount of contract modifications is included in the change order package. However, identification of funding source and funding availability are not recorded.
- **The A/E does not appear to be held accountable for design deficiencies.** While design deficiencies for change orders are tracked, it is not clear to what extent designers are held accountable for design issues.


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# III. Project Management – F. Change Order Management (continued)

## Suggested Improvements / Best Practices

- **OFEO should consider modifying the change order format to include funding information.** Funding verification should be recognized as critical to the change order review process. Identification of funding source as well as funding availability should be recorded on each change order.
- **The Smithsonian should consider developing a procedure for initiating contract modifications.** The number of change orders or a dollar amount threshold should be pre-determined for initiating a contract modification, to support a greater level of visibility into the financial situation of the project.
- **The Smithsonian should consider developing a methodology for holding the A/E accountable for design issues.** While it is recognized that financial charges for design deficiencies to the A/E need to be strategically applied, the Smithsonian could save costs by requiring designers to, at the very least, develop a remedy free of charge, and in more severe instances reimburse the Smithsonian for direct cost of rework. An in-depth contract review of the A/E contract would be beneficial to determine the extent that this is possible.
- **There is no formalized process to audit construction projects.** While the Office of the Inspector General has recently started to review and audit construction projects, there is no internal guideline tailored to the specific requirements of a construction project.

## Recommended Action Steps

9. **Establish a construction audit program tailored to the specific needs of construction projects.**
   - The Smithsonian should consider developing procedures to conduct periodic reviews of transactions related to construction activity. Those procedures should provide the basic framework necessary to meet specific audit objectives established for the project. For example, specific construction audit program objectives could be:
     - Conducting ongoing pricing reviews of change orders to ensure that change orders are priced in accordance with the contract documents and that deficiencies do not exist in the pricing methodologies
     - Periodically reconciling project expenditures to ensure that discrepancies do not exist between the contract billings and the actual payments
   - **This is a "quick hit" – a low impact/low resource action.**


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# III. Project Management – G. Invoice and Fund Control

**The invoice and fund control processes are effectively managed by OFEO and O-Con personnel.**

## Findings

- **A/E invoices are reviewed by the Design Manager.** The Design Manager is responsible for reviewing the A/E invoices and makes final recommendation for payment to O-Con. A copy is also sent to the Finance Department.
- **Contractor pay applications are reviewed by the Resident Engineer.** The Resident Engineer is responsible for reviewing the contractor pay applications that are required by contract to be submitted on a monthly basis. After the review of the pay application and verification of funding availability through the financial system PFITS recommendation for payment to O-Con is formulated.
- **Invoices are processed through the Office of Contracting**. The A/E invoices and contractor pay applications are submitted to O-Con for payment after appropriate reviews.
- **The POB project fund is managed by the Project Manager.** The Project Manager is responsible for managing the project funding. The Resident Engineer has no control over the funding. However, it is the Resident Engineer that requests additional funding when the project has no contingency left. The request is sent to the project manager and the Director of Project management for review and subsequent approval.

## Suggested Improvements/ Best Practices

- **There are no specific suggestions for improvement.**

## Recommended Action Steps

- **There are no specific action steps to consider.**


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# III. Project Management – H. Filing and Document Control

**The existing filing system is efficient and the Smithsonian is considering using an electronic system to enhance the filing and document control process.**

## Findings

- **Electronic filing is currently not is use, but the Smithsonian is considering archiving electronic documents using an electronic format.** Electronic documents such as emails and attachments would be made part of the permanent record using an electronic format.
- **Project documents are kept in different places during the project.** Project documents are available for review and are filed in a consistent manner, which facilitates transparency and audit efforts. During the project, each division involved with the project such as design, construction, and project management keeps its own set of documents.
- **A full-time person is dedicated to the archiving system.** At the end of a project, the project documents are sent to one person that is in charge of organizing and archiving the files into a filling cabinet kept in OFEO.

## Suggested Improvements / Best Practices

- **Establish process for scanning all documents for electronic filing and distribution.** Electronically scan all paper documents to shorten communication cycles for information by transmitting documents online instead of using traditional mail, fax or hand-delivery.
  - PDF is a universal file format that preserves all the fonts, formatting, graphics, and color of any source document, regardless of the application and platform used to create a document. PDF files are compact and can be shared, viewed, navigated, and printed exactly as intended. PDF features include - hyper-links, thumbnails, bookmarks, and annotations seen as electronic “Post-Its.”
- **Alternatively, implement a web-based tool to manage filing and documentation management system.** Ensure that all documents and communications are logged and accessed in a Web-site, providing a central repository and tracking tool for all electronic documents (RFIs, submittals, change orders, meeting minutes, logs). All secured and cleared stakeholders can access site and documents 24/7.

## Recommended Action Steps

- **There are no specific action steps to consider.**


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# III. Project Management – I. Quality Assurance/Quality Control (QA/QC) Program

**The QA/QC program contains good quality control elements such as contractor's quality control plan submitted prior to starting construction and regular on-site inspections.**

## Findings

- **The Contractor provides the Quality Control Plan.** The Contractor holds the responsibility to submit the project quality control plan prior to start of the construction operations.
- **The Construction Management division receives and review the Contractor's QC program.** As a part of the preliminary submission system the CM division reviews the QC plan provided by the contractor to verify that the contractor complies with the contract documents.
- **The review of actual work completed for Payment Applications is performed in the field by the COTR for construction.** The COTR for construction, with the support of the CM firm, conducts on-site inspections of work-in-place to determine whether percent complete is reasonable and ensure that the contractor's request for payment reflects actual site conditions.
- **The COTR for construction has oversight responsibility for contract compliance.** The COTR for construction is responsible for determining that the contract performs in accordance with all contract provisions. However, the COTR has no authority to render a decision on an issue that cannot be settled by mutual agreement, this being a responsibility of the Contracting Officer.

## Suggested Improvements / Best Practices

- **There are no specific suggestions to consider.**

## Recommended Action Steps

- **There are no specific action steps to consider.**


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# IV. Organization – A. Project Resources

**While the framework for project management within OFEO is considered a best practice, planned project management staffing levels for the POB may be inadequate to fully execute the oversight activities of the remaining work.**

## Findings

- **There has been several Project Executives for the POB project over the past two years.** Since William Thomas retired in January 2001 the position of Project Executive (PE) has been filled by three different people. In addition, in each instance the person in charge of overseeing the POB project was not fully dedicated to the project, except for the new PE that has recently been hired. These transitions happened at critical times for the project when the construction started and when the design was being finalized.
- **While the Project Executive is dedicated full time to the POB, the Project Manager has other responsibilities**. The current Project Manager (PM) has not been able to dedicate more than 60% of his time to the POB project, as he was heavily involved with the renovation of the Victor Building.
- **A new project structure appears to reduce dedicated Project Management resources**. A new project structure calls for the removal of the current PM and the take over of all project management activities by the PE. With the Physical Plant Renewal (PPR) project yet to be awarded, the reduction in project management oversight may be ill-timed.
- **Resources allocated to the field office are planned to be significantly increased**. The Resident Engineer office that currently has only one person will be supplemented by new resources. The plan calls for the Resident Engineer to be supported by a team of quality control inspectors and an engineering support team for cost estimating. Also, one of the current Design Managers is to be transferred to the field when the construction of the PPR project starts, expanding the field office to 6 FTEs.
- **The growth in OFEO's operating budget has not kept pace with the growth of the capital budget.** It appears that staffing levels have remained relatively constant while the capital spending has increased from $25 million in FY 2001 to $87 million in FY 2003.
- **A construction management firm has been hired to provide support services.** The CM firm acts as staff extension and provides all support services the COTR for requires to execute the construction contracts. These services include scheduling, cost estimating, change order management, field inspection, reporting, and administrative services.


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# IV. Organization – A. Project Resources (continued)

## Findings (continued)

- **OFEO's project management organization is considered an industry best practice.** The industry trend for project management is a "cradle to grave" approach that recognizes that individual projects may require varying levels of internal and external support, as well as varying levels of internal functional expertise.

## Suggested Improvements/ Best Practices

- **OFEO should consider additional staffing as current staffing levels may be inadequate.** Capital project management oversight manages the risks attendant with the design and construction of projects, and ensures the project best serves the Smithsonian's mission and achieves cost, schedule, and performance goals. There may not currently be sufficient resources to fully develop and execute the many project management oversight activities required throughout the project lifecycle. While OFEO plans on adding staff, these resources are not available now to fully develop and finalize the project management oversight process.

## Recommended Action Steps

10. **Evaluate the current relationships between planned capital expenditures and operating budget to identify project management resource requirements over the next five years.**
    - OFEO should consider the proper relationship between the total annual cost of project management in relation to the total annual capital budget. It should be determined if capital project budgets should share some of the project management burden, considering that there may also be future non-OFEO project management requirements for large capital projects.
    - The outcome should be a forward looking staffing plan that outlines the increasing project management requirements of the increasing capital budget.
    - **This is a "high priority" – a high impact/low resource action.**


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# IV. Organization – B. Policies and Procedures

**The recently published Facilities Project Management Handbook will serve as an excellent source of information to project participants on project roles, approval processes, and performance measurement.**

## Findings

- **The Smithsonian has recently published the Facilities Project Management Handbook.** This new procedures and guidelines manual replaces a construction guidelines manual last revised in 1995.
- **The Facilities Project Management Handbook may be considered an industry best practice.** Based upon the review of numerous policies and procedure manuals, the OFEO manual may be considered industry best practice due to its thoroughness and attention to roles and responsibilities during project execution.

## Suggested Improvements/ Best Practices

- **Continue to refine the Facilities Project Management Handbook.** While "best-in-class," there are opportunities to further expand, clarify, and modify some areas of the Handbook to improve the management of the POB project and future projects. These include:
  - **Budgetary and Execution Level Financial Oversight and Contingency Management.** The Handbook does not outline budget and execution level financial oversight. There is limited documentation on budget tracking, contingency usage, and forecast-to-complete reports. Forecast-to-complete reports maintain the current status of planned versus actual expenditures, and forecasts a total cost of the project at completion.
  - **Change orders.** The Handbook outlines a relatively clear process for submitting changes. However, several items could be added, including the specific review responsibilities of each change order reviewer as to entitlement (within or out of scope), breakdown of costs by reason codes, and funding source on each change proposal.

## Recommended Action Steps

11. **Continue to monitor the development of the new Facilities Project Management Handbook and ensure it is implemented on the remainder of the POB project.**
    - The major benefits of documented policies and procedures include the communication of project standards to new project team members, control processes for audit compliance, and communication to senior management on project activities. OFEO has written a strong Handbook – ensuring it is followed by project participants is paramount to its overall success.
    - **This is a "High Priority" – a high impact/low resource action.**


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# V. Project Accounting and Technology – A. Cost Tracking

**The existing PFITS cost accounting system is effective in tracking the POB project execution costs. Further creation of standardized reports and the planned integration of disparate budget and execution systems will improve overall project management for the POB project and future projects.**

## Findings

- **The Smithsonian's accounting system has recently been updated to Peoplesoft.** The previous system, known as the Smithsonian Financial System (SFS), had limited project management capabilities. As a result, OFEO, like several other Smithsonian internal units, has created and maintained a proprietary accounting system, known as the Project Financial Information Tracking System (PFITS), which OFEO's Project Managers and Project Executives use to keep track of project costs.
- **Reconciliation is required to keep the systems updated**. The PFITS system is totally separate from the official Smithsonian system and manual transfer of data is required to maintain current data in both systems.
- **PFITS currently has limited capabilities in tracking key construction project activities.** The ability to monitor meaningful construction data in a consistent, uniform, and transparent fashion is limited. Key project information to be tracked includes details about baselines, expected cash flows, estimates at completion, pending changes, claims and performance indicators, in addition to the accounting reports based on actual payments. One step to address this issue - the ability for PFITS to link to MSProject files - is currently being investigated by the PFITS team.
- **A limited number of standard reports have been requested and created.** With Reportwriter, PFITS has untapped potential to create standardized management reports as the demand for project management reports is identified. Ad-hoc reporting to address specific requests for project information is often completed in Excel spreadsheets.
- **There is limited training documentation developed to ensure the proper use of PFITS.** While the PFITS system has been in use for many years, no training manual has been developed, which may impact the ability of new project management staff to gain knowledge of the system. In addition, the system is highly dependent on the knowledge of a small number of staff who are responsible for both maintaining the system and entering the budget figures.


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# V. Project Accounting and Technology – A. Cost Tracking (continued)

## Suggested Improvements / Best Practices

- **Create additional standardized project management reports.** As applicable, Project Executives and Project Managers should consider replacing ad-hoc excel spreadsheet reports with standardized PFITS reports to ensure higher levels of data integrity and information dissemination.
- **Integrate disparate systems for management reporting and for tracking all project budgets and project execution costs.** An owner's cost accounting processes (and systems) should incorporate, record and report all budgets and all costs incurred in the course of a project. Specifically, the processes should capture the following four types of data within each level of the work breakdown.

**Figure 7 – Illustrative Work Breakdown Structure for Cost Tracking**

**Budget** – the baseline (as approved by the fund-appropriating authority) against which costs are measured. Specific budget data to track include:
- original budget line item amounts
- revisions to line item amounts
- line item descriptions
- approval dates
- budget document reference numbers
- funding sources

**Commitments** – contracted financial dealings made on behalf of OFEO to outside parties. Commitments include originally contracted amounts and contract amendment amounts:
- base contract amounts
- executed change order amounts
- dates of execution of commitments and descriptions
- commitment document reference numbers
- commitment types (reason codes)

**Forecasts** – anticipated commitments required to complete the budgeted work-scope. Forecasts should be made independently of current project funding, and should not therefore simply reflect remaining budget balances. Specific forecast data to track include:
- pending commitment amounts
- not yet pending commitment amounts
- forecast descriptions (explanation for making forecast)
- document reference for forecast (if a pending change)
- forecast commitment types (reason codes)

**Payments** – payments are expenditures incurred against agreed commitments. Specific payment data to track include:
- invoice reference number and description of work
- invoice work date
- payment amount against base contract
- payment amount against change orders
- retainage amount
- net payment amount
- payment date


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# V. Project Accounting and Technology – A. Cost Tracking (continued)

**Recommended Action Steps**

12. **Study cost tracking requirements of future programs and the ability of existing systems to meet these requirements.**
    - Using existing system reports and data accessibility as baselines, consider outlining cost tracking work breakdown structure, output requirements, and assess the feasibility of updating existing systems.
    - The outcome should be detailed option plans for cost tracking system based upon specific cost tracking and reporting requirements and the assessment of the current system environment.
    - **This is a "core challenge" – a high impact/high resource action.** Adequate cost tracking and reporting for the active management of project costs is imperative for successful program delivery. The Smithsonian should outline what is desired from a cost tracking system, and assess the current environment to see if it can meet these needs. New system implementations are costly endeavors that come with high risks and should only be undertaken if the current environment can not be updated.


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# V. Project Accounting and Technology – B. Management Reporting

**There are limited financial management reports that highlight the health of the POB project in terms of performance metrics, planned vs. actual costs, and schedule updates. Further investigation into key performance indicators and project reporting templates will benefit the management of the POB project.**

## Findings

- **Construction progress reports are issued on a monthly basis.** The CM firm is required by contract to report on construction progress and a management level report is extracted from it. This report contains information on safety, schedule, funding and critical issues.
- **There is limited financial and change management information.** The monthly construction report provides limited cost information (original budget, current budget, cost at completion estimates, payments and retainage) and change management information (RFIs, change orders and other pending changes), although tracked in a separate system, is not reported.
- **Reports to senior management do not provide adequate visibility into the POB project.** While reports to senior management exist, they fail to adequately report on project status. Budget information and critical issues for management action are not communicated.
- **Several key performance indicators (KPI) are outlined in the new Handbook, but are not yet actively being managed.** No KPI reports were reviewed as part of this assessment.

## Suggested Improvements / Best Practices

- **Determine what the Smithsonian wants to measure, and what types of reports senior management would like to see.** The Smithsonian should determine what project performance its want to measure, and why, and incorporate these measurements into management reporting templates.
- **Determine who should be responsible for management reporting.** Determine which reports should be completed by the contractors and which reports should be the Smithsonian's responsibility.


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# V. Project Accounting and Technology – B. Management Reporting (continued)

## Suggested Improvements / Best Practices (continued)

- **Consider using Earned Value as a management measure.** Earned value was developed to help project owners manage and contain the cost risks associated with their projects, in particular provide a firm project baseline and accurate financial forecasts. The technique is based on three dimensions:
  - **Planned Value**, which consists of the authorized work, along with the authorized budget and within the authorized time-frame. This forms the project baseline.
  - **Earned Value**, which is the authorized work that has been completed
  - **Actual Costs**, which are the actual costs incurred to convert the Planned Value into the Earned Value

**Figure 8 –Earned Value Measurements**

- This figure illustrates the objectives and benefits of Earned Value measurements for project owners.

### Objectives

- Plan all work prior to beginning it
- Measure performance based on an objective set of technical criteria
- **Analyze schedule status and projections using a time phase Critical Path Method network**
- **Analyze the project expenditures in light of the work accomplished**
- Quantify technical problems within the context of cost and schedule parameters
- **Forecast completion date and final cost**
- **Take corrective action**
- **Maintain disciplined control of the performance measurement baseline**

### Benefits to Project Owners

- Objective measurement of work accomplished helps develop plans to identify and resolve problems at a time when the resolution will be reasonably inexpensive
- Provides true cost condition
  - **Encourages realistic projections of final cost**
  - **Enhance accuracy of financial forecasts**
- **Reduces propensity of customer to add work without adding budget**
- **Fosters management decisions within a framework of reality**

Source: Primavera Systems


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# V. Project Accounting and Technology – B. Management Reporting (continued)

## Suggested Improvements / Best Practices (continued)

- **Augment the existing Key Performance Indicators in the Project Management Handbook, and use KPIs to measure the success of the project and the effectiveness of the financial and project management controls.** See **Figure 9** below for sample KPI metrics.

**Figure 9 – Sample Key Performance Metrics**

- This figure highlights some of the basic KPI metrics types, the sample metric to be used, and the significance of the metric.

| Metric Type | Sample Metric | Significance |
|---|---|---|
| **Scope** | **SF / Activity** | Scope establishes a programmatic baseline This is useful for tracking baseline of single project and in comparing costs of similar projects. |
| **Cost** | **Contingency Usage** | Contingency usage is expected, but the proportion of that usage compared to the percent complete of a project should be monitored. Significant allocation of contingency early in a project may be a signal of design or or construction issues and indicate a potential budget overrun. |
| **Schedule** | **Milestones** | Slippage in a project's milestone dates can be an early warning that the overall project schedule may not complete in a timely manner. If a project end date is fixed, subsequent project phases may need to be compressed to maintain schedule. |
| **Program** | **Planned vs. actual spend** | While some cost variance may be expected, large increases may require additional funding resources. Excessive differences may be the result of significant project level concerns - design difficulty, constructability, contractor issues, schedule or scope. |
| **Management** | **Requests for Information** | If management is not responding to RFIs within a reasonable timeframe it may be an indicator that management efforts are inefficient, inadequate or overburdened. In addition, the relative number of RFI's is a good indicator of design quality and change orders. |
| **Historical** | **Consultant Fees** | Tracking the actual fees as a percentage of project costs will assist in future capital budgeting, and help measure the efficiency of consultants. |


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# V. Project Accounting and Technology – B. Management Reporting (continued)

## Suggested Improvements / Best Practices (continued)

- **Consider creating single page project summaries that identify KPI's, performance thresholds, and status updates.** See the **Key Performance Indicators Sample Template** below.

Current STATUS: **Action Needed**

Previous Status: Warning

**Figure 10a – Single Page Summary Report (continued on next slide)**

- Key Performance Indicators (KPI's) measure, on a quantitative basis, the success of a project and the effectiveness of the project team's management processes.
- Examples of KPIs include:
  - **Scope** – Ratios of original to current.
  - **Cost** – Estimated vs. forecasted, payments vs. commitments, ratios of Change Orders.
  - **Contingency** – Ratios of contingency to percent complete.
  - **Schedule** – Original dates vs. forecasted dates.

**Construction Project**
**PROJECT EXECUTIVE SUMMARY REPORT**

Project Name :
Project Number :
Project Manager :
Project Phase :

Current Report Date :
Data Date :
Previous Report Date :

| | KPI | Metric/Value | Data Point | Data Point | Trigger/Status | Comments |
|---|---|---|---|---|---|---|
| Scope | Building (SF) | Ratio of original/current | Original Building SF | Current Building SF | > +/- 5%- yellow<br>>+/- 10%- Red | |
| | | | | | OK | |
| | - | | | | | |
| | | | | | | |
| Cost | Budget Variance $ | Difference between Est. Cost at Completion & Approved Budget | Approved Budget | Est. Cost at Completion | > $1 - yellow,<br>> $4% - red | |
| | | | | | Action Needed | |
| | Budget Variance % | Previous Bud. Var. / Current Bud Var. | Previous Bud. Var. | Current Bud Var. | > +/- 3% - yellow<br>> +/- 5% - Red | |
| | | | | | Action Needed | |
| | Cost Growth | Current Est. Cost at Completion / Previous | Current Est. Cost at Completion | Previous Est. Cost at Completion | > +/- 5% - yellow<br>> +/- 10% - Red | |
| | | | | | Action Needed | |
| | Payments | Difference between Total Payments & Total Commitments | Total Payments | Total Commitments | > -$1 - yellow<br>> -5% - Red | |
| | | | | | OK | |
| | Approved Change Orders | Ratio of Current total CO's $/ Previous total CO's $ | Current total CO's | Previous total CO's | > 1.25 - yellow<br>> 1.50 - Red | |
| | | | | | Action Needed | |


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# V. Project Accounting and Technology – B. Management Reporting (continued)

## Suggested Improvements / Best Practices (continued)

- See the **Key Performance Indicators Sample Template** below.

**Figure 10b – Single Page Summary Report (continued from previous slide)**

- Tracking metrics and rolling them up into project reporting helps elevate key project issues so that they can be expeditiously managed by project staff and scrutinized by project executives.
- Key metrics are monitored on a monthly basis and compared to previous or target values. Performance parameters, customizable by senior managers, trigger a status indicator for each metric ("red" = Action Needed, "yellow" = Warning, "green" = OK). These metrics are further rolled up into one status indicator per project which is shown on the Program Summary Report.

| | | | | | | |
|---|---|---|---|---|---|---|
| Contingency | Construction Contingency | Ratio of % Contingency Allocated / % Project Complete | % Contingency Allocated | % Project Complete | > 1.25 - yellow<br>> 1.5 - red | |
| | | | | | Action Needed | |
| | Owner Reserve | Ratio of % Contingency Allocated / % Project Complete | % Contingency Allocated | % Project Complete | > 1.25 - yellow<br>> 1.5 - red | |
| | | | | | Action Needed | |
| Schedule | Design Development Docs complete | Projected or Actual Date - Original Date | Projected or Actual Date | Original Date | > 1 day, yellow<br>> 7 days, red | |
| | | | | | OK | |
| | Construction Start | Projected or Actual Date - Original Date | Projected or Actual Date | Original Date | > 14 days, yellow<br>> 28 days, red | |
| | | | | | Action Needed | |
| | Construction End | Projected or Actual Date - Original Date | Projected or Actual Date | Original Date | > 7 days, yellow<br>> 14 days, red | |
| | | | | | Action Needed | |
| | | | | | | |
| Leading Indicator | Requests for Information | Ratio of current to previous RFI's | # of RFI's this month | # of RFI's last month | > 1, yellow<br>>1.5, red | |
| | | | | | OK | |
| | Requests for Information | Number of current outstanding RFIs (>10 days) | outstanding RFI's this month | NA | > 1, yellow<br>>10, red | |
| | | | | | Action Needed | |
| | Claims | Value of Current Claims ($) | Current claims $ | previous claims $ | > $5,000, yellow<br>> $10,000, red | |
| | | | | | Warning | |
| Other | PM Concern | Description of Issue | | | Issue - Yellow<br>Major Issue - Red | |
| | | | | | Action Needed | |

| | | | | | |
|---|---|---|---|---|---|
| Prepared By: | | PM Approval Date | | VP-Construction Approval Date: | |


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# V. Project Accounting and Technology – B. Management Reporting (continued)

## Suggested Improvements / Best Practices (continued)

- **Consider creating single page project summaries that identify KPI's, performance thresholds, and status updates.** See the **"Project on a Page" Report Sample Template** below.

**Figure 11 – Illustrative "Project on a Page" Report**

ILLUSTRATIVE

**Project Detail**
**Project:** Sample Project #1

**Project Summary Report**

| Key Performance Indicators | | | | | |
|---|---|---|---|---|---|
| Indicator | Factor | Original | Current | Ratio | Calculation |
| Scope | Program Scope | | | | Current Program Net SF / Original Program Net SF |
| Scope | Building Metrics | | | | (Current Net to Gross SF / Original Net to Gross SF) x (Current Closure SF / Original Closure SF) |
| Budget | #RFI's | | | | Cumulative RFI's for prior and current periods and % increase |
| Budget | RFI Turnaround Time | | | | Average work days to return response and % change |
| Budget | Change Estimates | | | | Cumulative change estimates issued and % increase |
| Budget | Budget Variance | | | | Current GMP / Approved 100% SD Budget |
| Schedule | Critical Activity Ratio | | | | Number of Critical Activities Remaining / Total Number of Activities Remaining |
| Schedule | Schedule Variance | | | | (Revised Due Date 100%CD - Design Schedule Start Date) / (Original Due Date 100%CD - Design Schedule Start Date), in working days |

| Status: |
|---|
| Scope |
| Budget |
| Schedule |

| Expenditures: Budgeted and Actual | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Approved Budget | | Costs | | | | | Payments | |
| Original | Revised | Contracts | Signed Contracts | Forecasts | Cost at Completion | Budget Variance | Actual | % |
| a | b | c | d | e | f [f=c+d+e] | g [g=(f-b)/b] | h | j [j=h/f] |

| Contingency Usage | | | | |
|---|---|---|---|---|
| Contingency | Amount | Allocated | % Allocated | % Last Month |
| Design | | | | |
| Market | | | | |
| Construction | | | | |
| Owner | | | | |

| Change Order Monitor | | | | |
|---|---|---|---|---|
| Cause | Approved $ | % of GMP | Pending $ | % of GMP |
| Unforseen Conditions | | | | |
| Owner Requested | | | | |
| A/E Errors & Omissions | | | | |
| Regulatory Requirements | | | | |
| Total | | | | |

| Project Funding |
|---|
| |

| Schedule | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design | | | | | | | | | | Construction | | | | |
| Schematic Design | | | Design Development | | Construction Documents | | | | | | | | | |
| Start Date | Original Due Date | Current Completion | Original Due Date | Actual Completion | Original Due Date 50%CD | Actual Due Date 50%CD | Original Due Date 100%CD | Actual Due Date 100%CD | Actual Completion 100%CD | Previous % Complete | Current % Complete | Start Date | Original Completion Date | Forecast Completion Date |
| | | | | | | | | | | | | | | |


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# V. Project Accounting and Technology – B. Management Reporting (continued)

**Recommended Action Steps**

13. **Study project management reporting requirements. Establish and implement key performance indicators to measure the success of current projects and the effectiveness of the Smithsonian's construction programs.**
    - Using the recommendations as a starting point, consider identifying the types of information the Smithsonian wants to manage and what types of reports would be most beneficial to senior management. Outline report templates for review, and determine which reports could be delegated to contractors instead of Smithsonian personnel.
    - The outcome should be a reporting responsibility chart and sample formats for senior management reports. The outcome should include initial format and thresholds for KPI reporting and a manner in which to capture the information.
    - **This is a "high priority" – a high impact/low resource action.** Reporting on the health of capital programs within the Smithsonian and externally to Congress is critical to successful program delivery.


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# V. Project Accounting and Technology – B. Management Reporting (continued)

**Recommended Action Steps (continued)**

14. **Develop Earned Value metrics to help Project Managers determine the schedule and cost positions of their project.**
    - Below are some of the most used Earned Value metrics:

**Figure 12 – Earned Value Metrics**

| Term | Symbol | Formula | Checklist Actions |
|---|---|---|---|
| **Percent Complete** | **% Complete** | $\frac{\text{BCWP}}{\text{BAC}}$ | Ratio of work accomplished in terms of the total amount of work to do |
| **Cost Performance Index** | **CPI** | $\frac{\text{BCWP}}{\text{ACWP}}$ | Ratio of work accomplished against money expended (work done for resources expended) |
| **Verification Factor** | **VF** | $\frac{\text{BAC} - \text{BCWP}}{\text{EAC} - \text{ACWP}}$ | Ratio of work remaining against money remaining (efficiency which must be achieved to complete the remaining work with the expected remaining money) |
| **Schedule** | **SPI** | $\frac{\text{BCWP}}{\text{BCWS}}$ | Ratio of work accomplished against what should have been done (work done as compared to what should have been done) |

BCWS = Budgeted Cost for Work Scheduled
BCWP = Budgeted Cost for Work Performed
ACWP = Actual Cost of Work Performed
BAC = Budget at Completion
EAC = Estimate at Completion

Source: Primavera Systems

- **This is a "core challenge" – a high impact/high resource action.**


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# V. Project Accounting and Technology – C. Collaboration Tools

**Collaboration tools are not currently being utilized on the POB project, but can provide excellent communication, document management, and workflow functions to improve overall project management.**

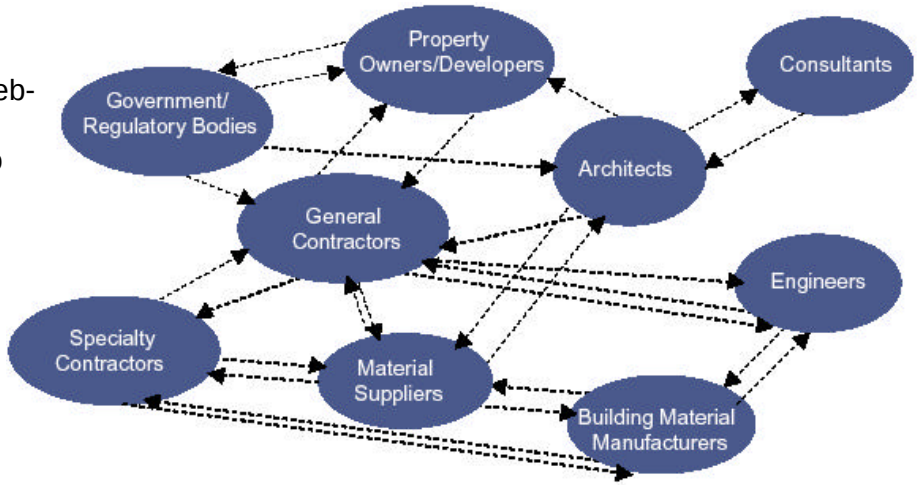
## Findings

- **No collaboration tools are used for the POB project.**

## Suggested Improvements / Best Practices

- **Use Web-based collaboration tools for all projects.** Web-based collaboration is a tool allowing project owners and construction teams to rapidly set up on-line workspaces to communicate a range of project information.
  - All documents and communications are maintained and accessed at a central site (e.g. Web-site). The Host Provider (ASPs or entities that supply software services via the internet) are easy to use such that IT managers do not become mired in the technical-implementation details.
  - The service links infinite users with architects, owners, contractors and project managers to promote design and construction collaboration and ensure a transparent management process for Construction Programs.
  - Stakeholders/ users operate the service from their computer, accessing documents or communications from links. These links are established, designed and agreed upon by the project team before launching the tool.

**Figure 13 – Diagram of Communication and Value of Collaboration Tools for Various Types of Projects**




80% of Firm Leaders say project web sites are, at least, somewhat effective in improving project management.

| | |
|---|---|
| ***Best for Large Projects*** | ***78%*** |
| ***Valuable for Long-term Projects*** | ***66%*** |
| ***Best for Public Projects*** | ***26%*** |

* Source: ZweigWhite's 2001 IT & E-Business Survey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# V. Project Accounting and Technology – C. Collaboration Tools (continued)

**Suggested Improvements/ Best Practices (continued)**

- **NAVFAC is implementing a web-based collaboration tool for global project management.** NAVFAC is developing a web-based construction management system that will serve as the global technological backbone for all of NAVFAC's field office processes, with hosting by an Application Service Provider. The functionality of the system includes the establishment and overall electronic management of the following processes:
  - RFI's and submittals
  - Invoice processing
  - Constructability reviews
  - Safety audits and project closeout
  - Schedule integration
  - Invoice processing
  - Daily reports
  - Project photos

**Figure 14 – Functions and Owner Benefits from Collaboration Tools**

| Collaboration Functions | Benefits to Project Owners |
|---|---|
| **Project Management**<br>▪ Project administration<br>▪ Correspondence<br>▪ Meeting minutes<br>▪ Schedules<br>**Document Management**<br>▪ Working Drawings<br>▪ Photos<br>▪ Schedules<br>**Workflow Management**<br>▪ Change Orders<br>▪ Estimating/Budgeting<br>▪ Approvals | **Increase Efficiency**<br>▪ Sharing Information with key stakeholders<br>▪ Lowering lead times in critical activities<br>▪ Reducing repetitive and redundant work<br>**Lower Operational Costs**<br>▪ Streamline Internal/External Processes<br>▪ Less Paperwork<br>▪ Higher Productivity<br>**Enhance Customer Relationship**<br>▪ Providing on-line information<br>▪ Streamlining the change/approval process<br>▪ Automating billing and cost tracking processes<br>▪ Providing value added services |


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# V. Project Accounting and Technology – C. Collaboration Tools (continued)

**Recommended Action Steps**

15. **Study the benefits of web-based collaboration on the remaining work and for future programs.**
    - Consider reviewing existing systems in the marketplace, comparing functionality, processes, costs, security, and applicability to OFEO programs.
    - The outcome should be contract language mandating the use of web-based collaboration tools in the next solicitation supported by vendor or performance specifications.
    - **This is a "high priority" – a high impact/low resource action.**


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# VI. Action Plan
# A. Summary of Action Steps

**Summary of Recommended Action Steps**

**"High Priority" – High Impact/ Low Resources**

**(3)** **Cost Control.** Monitor contingency usage against percent completion for cost control performance.

**(6)** **Schedule Control.** Increase construction oversight of schedule reporting for contract compliance.

**(8)** **Client Management.** Establish a higher level of project oversight to ensure all Smithsonian project issues are addressed and all Smithsonian stakeholder input is considered.

**(10)** **Project Resources.** Evaluate the current relationships between planned capital expenditures and operating budget to identify project management resource requirements over the next five years.

**(11)** **Policies and Procedures.** Continue to monitor the development of the new Facilities Project Management Handbook and ensure it is implemented on the remainder of the POB project.

**(13)** **Management Reporting.** Study project management reporting requirements and key performance indicators.

**(15)** **Collaboration Tools.** Study the benefits of web-based collaboration on the remaining work and for future programs.

**"Quick Hits" – Low Impact/ Low Resources**

**(1)** **Cost Control.** Establish "audit trail" documentation for all changes to the baseline budget.

**(2)** **Cost Control.** Establish a standardized format for cost estimates that is inclusive of all known costs.

**(4)** **Cost Control.** Manage separate budgets and contingencies for each individual project contract.

**(5)** **Schedule Control.** Increase the responsibility of the contractor in regard to schedule reporting.

**(7)** **Client Management.** Ensure that the A/E receive instructions only from OFEO.

**(9)** **Change Order Management.** Establish a construction audit program tailored to the specific needs of construction projects.


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# VI. Action Plan
## A. Summary of Action Steps (continued)

**Summary of Recommended Action Steps (continued)**

**"Core Challenge" – High Impact/ High Resources**

**(12) Cost Tracking.** Study cost tracking requirements of future programs and the ability of existing systems to meet these requirements.

**(14) Management Reporting.** Develop Earned Value metrics to help Project Managers determine the schedule and cost positions of their project.

**"Low Priority" – Low Impact/ High Resources**

**None**


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# VII. Appendices – A. Documents Reviewed

- Repair, Restoration and Alteration of Facilities Program Report, NAPA, dated 7/2001
- Critical Assessment – dated 9/28/200
- POB Master Schedule Update – October 2001
- POB project Chronology
- Project Organizational Chart
- Monthly Project Report from the project manager
- Project reports to senior management including the Director of OFEO and the Oversight Committee
- Monthly Progress Report from Bovis
- The Facilities Project Management Handbook – draft dated 9/12/2002
- Construction Division Procedural Guidelines – Third Printing, dated 9/1995
- Capital Asset Plan (Exhibit 300) for Revitalization and Construction for FY 2004 Budget Submission, version 1 dated 9/9/2002
- Project Specifications for the PPR project, dated 8/19/2002
- Request for Information (RFI) logs for Gross Demolition and Exterior Window projects
- Contract Modifications for Gross Demolition and Exterior Window projects
- Project Definition Rating Index (PDRI)
- Independent Estimate Review, ANADAC Facilities Group, dated 10/1/1998
- 100% Cost Estimate for PPR, Becker & Frondorf, dated 9/24/2002
- 100% Cost Estimate for PPR, Bovis, dated 9/26/2002
- Schematic Design Estimate for Courtyard Auditorium, Bovis, dated 6/15/2001
- 70% Cost Estimate for PPR, Bovis, dated 2/17/2000
- 100% Cost Estimate for Gross Demolition, Becker & Frondorf, dated 3/23/2000
- 95% Cost Estimate for Gross Demolition, Bovis, dated 2/17/2000
- 100% Cost Estimate for Exterior Stone, Becker & Frondorf, dated 3/5/2001
- 70% Cost Estimate for Exterior Stone, Bovis, dated 2/17/2000
- A/E Contract
- Construction Contracts
- CM Contract
- Project Funding and Schedule Analysis, Bovis & Hartman-Cox, dated 3/2000
- Cost of Completion Evaluation, Office of Project Management, dated 10/24/2002


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# VII. Appendices – B. Interviews Conducted

**Office of Facilities Engineering and Operations (OFEO)**

- Clair Gill, Director, Office of Facilities Planning and Resources
- Sheryl Kolasinski, Director, Office of Project Management
- Kenneth Olmsted, Director, Office of Engineering, Design and Construction
- Steven Butler, Associate Director, Resource Management
- Derek Ross, Assistant Director for Construction Management
- Anna Franz, Project Executive
- Steven Groh, Project Manager
- Sarah Drumming, Resident Engineer
- Harminder Jolly, Design Manager
- Joy Jordan, Design Manager
- Vicky Cundiff, Budget Analyst

**Bovis**

- Brian Grove, Project Manager

**Smithsonian American Art Museum**

- Elizabeth Broun, Director

**National Portrait Gallery**

- Marc Patcher, Director
- Steven di Girolamo, POB Project Manager

**Office of the Under Secretary for American Museums & National Programs**

- Anthony McCann, Director of Financial Affairs

**Office of the Treasurer**

- Sudeep Anand, Treasurer

**Office of Planning, Management and Budget**

- Bruce Dauer, Director
- Kathleen Johnson, Assistant Director for Planning & Management Support


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