INTERNAL AUDIT

Capital Improvement Program – Project Delivery Audit

Prepared by

Craig Hametner, CPA, CIA, CISA, CMA, CFE
City Auditor

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Table of Contents

Authorization

The City Auditor has conducted a Capital Improvement Program (CIP) – Project Delivery audit. This audit was conducted under the authority of Resolution #2013-51 and in accordance with the Annual Audit Plan approved by the League City, City Council.

Objective

The objective of this audit was to determine if the process is as efficient and effective as it can be. The two sub-objectives are as follows:

1) Determine if general controls are sufficient and appropriate
2) Determine through sampling if there are any notable lapses in Project Delivery

Scope and Methodology

The City Auditor conducted this audit in accordance with Generally Accepted Government Auditing Standards except this audit function has not had an external peer review. Those standards require planning and performing the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for the findings and conclusions based on the audit objectives. The City Auditor believes that the evidence obtained provides a reasonable basis for the findings and conclusions based on the audit objectives.

The sampling methodology is discussed in Exhibit A and the reliability and integrity of information is discussed in Exhibit B.

To adequately address the audit objectives and to describe the scope of work on internal controls, the City Auditor has:

- Inquired with the previous Director of Engineering and current Interim Director of Engineering regarding their processes
- Read other cities audits and project delivery manuals, presentations to city council, best practices
- Examined project books which contain all essential information regarding the Capital Improvement Project

While there are many different types of audits related to a CIP audit, this audit primarily emphasized Project Delivery. Regarding Project Delivery this audit emphasized the Project Management side of Project Delivery. Project Management includes the monitoring elements of quality, cost and schedule (time) and the managing elements of risk, talent and scope. This audit also evaluated whether the

city has the means to determine if efficiency and effectiveness over Project Delivery is present.

The previous Director of Engineering developed a Project Delivery Plan Manual which is to be followed by the Project Managers. According to the memo prefacing the Manual (Page 2), the Project Managers roles and responsibilities for schedule are as follows:

1) Council Action Dates/Decision Points
2) Land Acquisition Strategy and Schedule
3) Preliminary Engineering/Engineering Agreements
4) Engineering Schedule
5) Utility Relocation Schedule
6) Bid Schedule
7) Construction Schedule

This audit used the Project Delivery Plan Manual (completed 10/21/13) as a guide for how the Project Delivery process should work. According to this source (Page 1), "This project delivery plan addresses many of the steps necessary to successfully deliver a project from start to finish. The items listed below shall help direct the Project Manager (PM) in developing a successful Capital Improvement Project and allow the PM to manage the project from inception to construction while maintaining budget and schedule." Noteworthy here is the concern for both budget and schedule. On Page 2 of the memo prefacing the manual it is stated, "It is understood that schedule is very important to a successful CIP project. The PM is responsible for ensuring the development of a manageable schedule and the maintenance of that schedule."

This audit is about Project Delivery for separate projects. It is not intended to evaluate the different Project Delivery methods.

The deficiencies in internal control that are significant within the context of the audit objective and based upon the audit work performed are stated in the Opportunities for Improvement section starting on page 6.

Background

Currently, the city is informed of CIP progress by the Monthly CIP Status Report. As of the April/May 2014 time period there were 60 active projects. The break-out by program area is as follows:

- Streets – 10
- Traffic – 5
- Drainage – 4
- Police - 1
- Fire – 1

- EMS – 1
- Facilities – 3
- Parks – 7
- Economic Development – 3
- Water – 17
- Wastewater – 8

The city has three primary project managers that are responsible for all 60 projects. Along with the primary project managers, the city has three part-time project managers. Two employees provide CIP program support.

A way to illustrate the Project Delivery process is by way of Gauges and Levers. Gauges tell us how we are doing. Gauges include cost and time. Levers are the way to manipulate or produce the results on the gauges. Examples of levers are Scope, Risk and Personnel. To optimize the Project Delivery Process it has been said that the Project Manager needs to keep their hands on the levers and the eyes on the gauges. The levers control the reading of the gauges. In other words, one must manage the levers and monitor the gauges.[1]

Project Delivery comes down to these key questions that Capital Projects need to answer.

- Is it on-time and on-budget?
- How can we improve the process?

Overall Conclusion

The Project Delivery Manual provides a very good foundation for the project managers; however, several improvements should be made to it.

The city's reporting system for the CIP actual vs. budget dollars is in place and working effectively with quarterly reports being generated and disseminated to the various users.

The city's reporting system for the CIP actual schedule vs. budget schedule needs improvement along with linking schedule with cost. Without a comprehensive reporting system, the city lacks the means to determine root causes for project delivery failures.

[1] From the article, "Project Levers and Gauges" by Stacy Goff

Opportunities for Improvement

During the audit there was identified certain areas for improvement. The audit was not designed or intended to be a detailed study of every relevant system, procedure, and transaction. Accordingly, the Opportunities for Improvement section presented in this report may not be all-inclusive of areas where improvement might be needed.

Management is in a unique position to best understand their operations and may be able to identify more efficient and effective approaches to the following recommendations:

Finding #1 – Project Delivery Manual – Sub-objective #1
Condition (The way it is)
The Project Delivery Manual does not address several important Project Management tasks. They are as follows: 1) Lessons Learned Section 2) No Past History Kept on Contractors 3) No Discussion on Risk Analysis 4) No Discussion on Project Manager Performance Measurements 5) No Discussion on Linking Cost and Schedule 6) No Discussion on Project Management Thresholds
Criteria (The way it should be)
Project Delivery Manual should be comprehensive enough to give proper guidance to the responsible parties.
Effect (So what?)
Continuous improvement in Project Delivery may be hampered which may increase the cost of the project and delay the project completion. This in turn may lead to public sensitivity risk. Projects may show increases in schedule and cost. Indirectly, additional planning and oversight may be required.
Cause (Difference between condition & criteria)
Compiling a Project Delivery Manual is a difficult task to get comprehensive enough the first time around.
Recommendation
Revise the Project Delivery Manual and implement the following sections: 1) Lessons Learned Section – Discussion during and after the project should note what went right with the project and what went wrong. This should be written to memorialize and mine the information for future reference. Documentation should include naming the issue, a brief description of problem or success, impact on the project and the process improvement recommendations. Consequences of not having a project review of lessons learned are the increased likelihood of repeating actions that might have caused:

- Project Failures
- Budget Overruns
- Scope Creep
- Reduced Quality from Expectations
- Missed Scheduled Deadline[2]

This provides a means of continuous improvement for Project Delivery and facilitates Life Cycle Management for Capital Projects.

2) No Past History Kept on Contractors - This information can be helpful for future projects. This may be part of the Lessons Learned Section. A grading system for contractors could facilitate the process. Contractors are part of the city's third party risk and as such that risk must be managed and monitored. A helpful guide is the Federal Acquisition Regulation (FAR) Subpart 42.15 – Contractor Performance Information.

3) No Discussion on Risk Analysis – Risks can damage projects. Risks can increase costs by setting projects back. One of the levers the city must manage is risk in the contract.

   Through inquiry it was found that discussion does take place regarding risk but no written documentation exists. The purpose of a risk analysis for capital construction projects is to determine the likelihood of mistakes and the magnitude of associated project costs and project delays.

   The Project Delivery Manual mentions the use of Gantt Charts. While Gantt Charts are a useful and easy way to provide accountability to the scheduling function they do not provide information on the critical path of tasks for the project. The critical path can make or break the scheduling of a project. It should be part of the risk analysis. Risks should be mitigated before they happen.

4) No Discussion on Project Manager Performance Measures – Performance measures assist in the management of talent. The purpose of performance measurement is to help organizations understand how decision-making processes or practices have led to success or failure in the past and how that understanding can lead to future improvements. They are also a mechanism for accountability and a method to identify areas for improvements. Considerations can be given to the following Project Management Performance Measures:

   - Schedule
     - Deviation from planned schedule (days)
     - Length of time to design

[2] From the article, "Importance of Lessons Learned in Project Management" by Dianne Davenport

- Number of milestone dates missed more than once

- Budget
  - Design cost as a percentage of budget
  - Construction as a percentage of overall cost
  - Construction engineering as a percentage of construction cost
  - Preliminary engineering as a percentage of overall project cost
  - Change order costs as a percentage of overall project cost
- Scope
  - Change in cost estimate at 30, 60, and 90 percent design
  - Percentage of established project objectives met at closeout (based on project manager review)
- Quality
  - Number of change orders caused by design errors
  - Results of citizen satisfaction survey[3]

You can't manage what you can't measure. It's like sailing a ship without a compass. The first step is to know what do your Project Manager's need to accomplish and how do the metrics support the business processes.

5) No Discussion on linking Budget and Schedule – There were no reporting requirements that were found for actual schedule versus budget schedule and relating it to actual cost vs. budget costs. See Exhibit C for explanation on how this can be accomplished.

6) No Discussion on Project Management Thresholds – Projects of different size ranges have different key characteristics. For example, a small project size may only expend a small amount of effort that being measured in work hours. This is opposed to a larger project which will take a large effort based on work hours. Likewise, the same holds true for the duration of the project and the ideal staffing. The role of the Project Manager can change from a small project (worker/coordinator) to (manager/leader) for large projects.

   The bottom line is that resources must be dictated by the size of the project. If there is large project that you work as a medium project there is added risk. Or, having an aggressive due date for a large project creates added risk. Developing Project Thresholds require good mining of project history.

   Different projects require different resources. Thresholds can be created for total cost of the project, total estimated time/effort in days (not calendar or continuous), or staffing requirements (current employees in place) vs. (cross-functional teams).

   The reporting requirements should also be taken into consideration

[3] From the City of Seattle report, "Capital Improvement Program Study of Seattle Transportation," September 6, 2001

depending on the size of the project. For example, a large project could use Earned Value Analysis while a smaller project could use a simple Gantt Chart.

Management Response

Generally agree …

1. The development and use of the project manual is an evolution to incorporate what works, what is important from a historical perspective and what is useful in the active management of projects. The current version is a first generation completed in October of 2013.

   Many of the schedule issues relate to preliminary project design/development such as: development of a consensus from the stake holders regarding scope and routing, approval of scope and routing, and processing through other agencies. In addition, changes in priorities, changes in staff, funding and acquisition of property also influence project schedules.

2. We keep history of contractors within each project file…it is not quantified but information is available regarding communications on how issues are addressed, change order negotiations and approvals, and schedule of the project. With the assistance of the Assistant to the City Manager a contractor/vendor report card is being developed that will make the information more readily available.
3. Agree
4. Project managers are reviewed as needed and formally at least annually. Documentation in the project manual/file will be improved to explain deviations in schedule and costs. In addition we meet weekly as a group to discuss projects, project schedules, obstacles, critical path items, measured risk, etc. in an effort to strategize collectively to push projects forward and minimize delay and risk.
5. Agree this should be improved. Currently the quarterly report reflects the adopted budget and a current budget. This has not been integrated into the project manual.
6. We agree that projects share some typical qualities…there is a contract/ agreement; there is a procurement process, payment process, etc. Then there are unique characteristics that impact the level of detail and sophistication required to reasonably tract and monitors the project. Minor projects with short duration do not need the same level of detail. Each project needs to be evaluated at implementation and the appropriate levels of the Project Manual need to be used as the project moves forward. We will continue to monitor the applications of the process and refine the manual as necessary based on type, size and duration of a particular project.

Action Plan
Work on a second generation of the project manual and get additional buy in from the project managers. Evaluate resourcing to make sure there are sufficient resources to address the steps and documentation necessary while keeping key projects moving forward. We need to move from reactive project management to proactive project management to better control schedule and costs. One of the critical areas is to more efficiently address right-of-way acquisition. This may require outsourcing some of this activity and moving acquisition through to eminent domain. We also need to improve our community outreach on the more challenging projects to better develop community consensus as we move these projects toward construction. Development of a contractor/vendor report card will be completed by the end of September and used going forward. Documentation within the project manual/file will be improved to document schedule changes/refinements and cost changes. Starting with the first quarter of fy 2015 we will include comparison of initial funding and schedule to current funding and schedule. The Engineering Director will be tasked with the evaluation and development of additional performance indices related to project management, project schedule and project budget during his first year with a recommendation due the first quarter of fy 2016. We will continue to monitor and customize the project manual as necessary based on type, size and duration of a particular project.
Implementation Date
The director of Engineering Earl Smith is schedule to start September 22, 2014. Evaluation and update of the project manual is a key initiative for his first 6 months. With an anticipated update around April 1, 2014. Development of a contractor/vendor report card will be completed by the end of September and used going forward. Documentation within the project manual/file will be improved to better document schedule changes/refinements and cost changes. Starting with the first quarter of fy 2015 we will include comparison of initial funding and schedule to current funding and schedule. The Engineering Director will be tasked with the evaluation and development of

additional performance indices related to project management, project schedule and project budget during his first year with a recommendation due the first quarter of fy 2016.

Finding #2 – CIP Spreadsheet – Sub-Objective #2
Condition (The way it is)
The CIP spreadsheet is not always kept up-to-date. Issues found are as follows: ➢ Two projects were not found on the spreadsheet. ➢ One project is set up electronically but no documents have been placed in the file ➢ One project did not have all relevant information placed in it
Criteria (The way it should be)
According to the Project Delivery Manual, "The Director of Engineering will be responsible for the development and maintenance of a spreadsheet that includes all CIP projects on it…..The PM is responsible keeping the Director of Engineering up to date and provides the proper information to the CIP spreadsheet to keep it up to date. The CIP spreadsheet will be updated monthly."
Effect (So what?)
Project Delivery can be hampered if the decision makers do not have up to date statuses on the projects.
Cause (Difference between condition & criteria)
It does not appear that all parts of the Project Delivery Manual have been fully implemented. Inquiry revealed that no training was provided on the Project Delivery Manual.
Recommendation
To fully optimize the use of the Project Delivery Manual, briefings on the subject matter would be beneficial.
Management Response
Agree. The project manual is a first generation document and the team is working to integrate this tool in there project management process. It is time for a full review of the document to create a second generation document.
Action Plan
The project management team will work with the new Director of Engineering to create a second generation of the project manual. They will continue to integrate all of the manual elements into their daily work to improve overall project delivery, reporting and management.
Implementation Date
Create a second generation project manual/file system to improve overall project delivery, reporting and management by April of 2015.

Finding #3 – Actual Time vs. Budget Time and Variance Analysis – Sub-Objective #2
Condition (The way it is)
Schedule is an important element of Project Delivery. Yet the sample indicated that only a couple projected Gantt Charts were present. No Gantt Chart was found comparing actual time to budget time. Consequently, no variance explanation for time delays was noted.
Criteria (The way it should be)
In the Project Delivery Manual it lists a requirement for Gantt Charts to be part of the Project Book. Gantt Charts are used to compare actual time vs. budget time
Effect (So what?)
Having a history of actual vs. budget times can be used for continuous improvement and for evaluation of the Project Manager. The lack of any variance explanations prevents a root cause analysis of project delivery failures.
Cause (Difference between condition & criteria)
Inquiry revealed that some in the department may not know how to construct a Gantt chart. No training was presented for the application of the Gantt chart.
Recommendation
Brief the department on the importance of scheduling (actual vs. budget) and determine if the Gantt chart is the best way to present such information. Variance explanations could be part of the lessons learned.
Management Response
Agree. The development of an accurate schedule and budget is a priority regarding the delivery of Capital projects. Many of the schedule issues relate to project routing, development of a consensus from the stake holders regarding scope and routing, approval, processing through other agencies, changes in priorities, changes in staff, funding and acquisition of property. In most cases the use of a Gantt chart is an effective way to track the progress of the projects. In major projects with a critical delivery schedule the development of more comprehensive Gantt chart or critical path schedule is necessary to better monitor progress. Currently, many projects do not meet identified milestones for a variety of reasons listed above and we need to improve our ability to document those. In addition we meet weekly as a group to discuss projects, project schedules, obstacles, critical path items, measured risk, etc. in an effort to strategize collectively to push projects forward and minimize delay and risk. Many times we are going from critical issue to critical issue based on the size and number of projects and do not completely document things that impact schedule and costs. It is clear we must improve.
Action Plan
1. Engineering will improve tracking of initial project milestones, costs and schedule and compare that with actual dates and final expenditures. This

comparison will be included in the quarterly report. 2. With the hiring of the new Director of Engineering we will have him evaluate development of additional indices previously identified. 3. The CIP program is very ambitious and we need to get the Engineering Director to make sure we are properly resourced and that resources are properly assigned to meet the expectations of the Council, community, and management. Over the past few years we have had a CIP in excess of $100 million and delivered approximately $50 million of projects. This should be completed by April of 2015 to be included as a part of the budget development for fiscal year 2016.
Implementation Date
1. Starting with the first quarter of fy 2015 we will include comparison of initial funding and schedule to current funding and schedule. 2. The Engineering Director will be tasked with the evaluation and development of additional performance indices related to project schedule and budget during his first year with a recommendation due the first quarter of fy 2016. 3. We will continue evaluating resources and make recommendations as a part of the budget development for fiscal year 2016.

EXHIBIT A

Sampling Methodology

Auditor judgmentally selected 10 Projects. They are as follows:

DR1302 – Genco Canal
FM1301 – Renovate Helen Hall Library
FR1301 – New Burn Building
PK0903 – Hometown Heroes Park (Pool)
ST1303 – Columbia Memorial Parkway
TR1204 – Fiber Network Traffic System to West Side
WT1102 – South Shore Harbor Pump Station
WT1108 – SH3 Pump Station
WT1206 – Countryside Pump Station & Well
WW1401 – MUD #6 Lift Station Rehab

EXHIBIT B

Reliability and Integrity of Information

The reliability and integrity of information appeared to be good as the examination of the Project Book includes source documents.

EXHIBIT C

Linking Cost and Schedule (Reference Opportunity for Improvement #1, Page 8, Number 5

Earned Value Analysis is a popular way of measuring project management performance. While some of the terms may sound complicated the actual calculation is not complicated. The two that are mentioned here are in the Top 10 Project Management Benchmarking Measures according to the Center for Business Practices[4]

The following describes two such calculations for Earned Value Analysis.

Cost Performance Index (CPI index) – It represents the amount of work being completed on a project for every unit of cost spent. It is computed by EV/AC.

EV = Earned Value is calculated as follows: Actual Completion (%) * Total Budget
AC = Total Spend to date

A value of above 1 means that the project is doing well compared to the budget.

Schedule Performance Index (SPI index) – This represents how close actual work is being completed compared to the schedule. It is computed by EV/PV.

EV = Earned Value is calculated as follows: Actual Completion (%) * Total Budget
PV = Planned Completion * Total Budget

A value of above one means that the project is doing well against the schedule.

An example will illustrate the simplicity of the calculation and the valuable information the indices can provide.

Total Budget $900,000
To be completed in 9 months
After one month completed 10% of the project and spent $100,000
The planned completion should have been 15%

Step One:

Calculate Planned Value and Earned Value

- Planned Value = 15% * $900,000 = $135,000
- Earned Value = 10% * $900,000 = $90,000

[4] "Measures of Project Management Performance and Value: A Benchmark of Current Business Practices," Comprehensive List of Measures, 2005, Center for Business Practices

Step Two:

Calculate Indices

- Cost Performance Index = EV/AC = $90,000/$100,000 = .90. This means for every $1 spent, the project is producing only 90 cents in work.

- Schedule Performance Index = EV/PV = $90,000/$135,000 = .67. This means for every estimated hour of work, the project team is completing only .67 hours (about 40 minutes)

So what does this say about Project Management Performance?

Since both indices are less than 1, it means that the project is over budget and behind schedule. The Project is in trouble and corrective action needs to be taken.[5]

Next Level Analysis

Using the Cost Performance Index with the Schedule Performance Index yields the Critical Ratio (CR) which is simply CPI * SPI. The result represents the project status. This indicator takes care of cost and schedule trade-offs. In the above example, the CR = .603. If this number is less than 1 it means poor project performance. If CR = 1 project performance is on target. If CR is greater than 1 it means good project performance.[6]

[5] "Earned Value Analysis in Project Cost Management: Calculate Cost Performance Index (CPI) and Schedule Performance Index (SPI)" written by Rupen Sharma, PMP, edited by Michele McDonough, from webpage www.brighthubpm.com/monitoring-projects/57944-calculating-cost-performance-in....
[6] "Want to Enhance Your Project Performance Metrics? Guide to EVM and Control Charts" contributed by Abhishek Soni from the Process Excellence Network, from webpage http://www.processexcellencenetwork.com/lean-six-sigma-business-transformation/articles/...