Case Study

Washington Suburban Sanitary Commission

Construction Inspection Process Improvement

Background

The Washington Suburban Sanitary Commission (WSSC) replaces approximately 55 miles of water main pipeline every year. A substantial amount of time and effort goes into planning these projects, applying public funds in large capital improvement projects spanning several years. WSSC's Pipeline Construction Division is responsible for management and inspection of the contract work following prescribed business processes, specifications for which reside in manuals, reports, "tribal" knowledge, and a specialized workflow automation tool (e-Builder).

The daily inspection report is a critical outcome of the inspection business process as the information in these reports is used for compliance reporting, management summaries, budget analysis, decision making, and many other purposes. The inspection reports have evolved from a paper report to Microsoft Excel spreadsheet, and now in an automated document management and reporting business process. As the scope and complexity of construction efforts increases, many opportunities for business process improvement become evident. WSSC initiated the Construction Inspection Business Process Improvement project to address the need for a rigorous methodology and tools to guide enhancements. The Utility Analysis and Improvement Methodology was selected for this purpose.

The goals of the project were to address the following three aspects of the construction inspection process:

1. Smarter Data Collection
    - Understand the best ways to organize existing and new data to simplify data collection, maximize the use of these data in other processes, and enable better decisions.
    - Support analyses that determine areas for improvement for To-Be business processes.
2. Simplified Reporting
    - Show how rationalizing the data organization (a) aids reporting by improving focus on important goals and (b) improves decision-making efficiency through greater consistency in applying business rules.
3. Better Management KPIs
    - Show how an improved business process leads to definition of metrics that demonstrate value to the environment, ratepayers, regulatory entities, and the commission.

Case Study Description

The project team adopted the UAIM methods (see 'Phase 2 Projects SoW-Final.docx' and embedded documents) and completed the project in the following five steps,

(1) conduct of a business process review and a goal-directed task analysis,
(2) development of an As-Is model to reflect the current construction inspection processes,
(3) conduct analysis of As-Is process and decide on improvements,
(4) develop a To-Be model that demonstrates the process improvements,
(5) implement a change management program to adopt the improvements.

The As-Is and To-Be models were implemented in a modeling tool that complies with the Business Process Model and Notation (BPMN) standard.

Step 1 defined the system being managed, the roles (persons) involved, and an understanding of how the goals of an improved business process are related. These are summarized as follows:

- What's being managed by the improved business process?
  - the ductile iron pipe construction site and immediate area
- What are the roles of relevant process personnel?
  - Inspector, Program Manager, Contractors, Management Stakeholders
    - there may be other roles involved, such as residents that live near the construction site, municipal divisions (police, utilities, etc.) required on-site, etc.
- What is the primary goal?
  - Ensure safe and efficient construction through assessment & reporting of progress
    - There were many identified sub-goals such as "attaining familiarity with the contract specifications", "observing, recognizing and reporting on construction conformance to specifications", etc.

Step 1 analysis helped to frame the process through a clear description of what is and what is not being managed, who will be impacted by changes and need to be involved in change management, and the goals that any improvement must achieve for success.

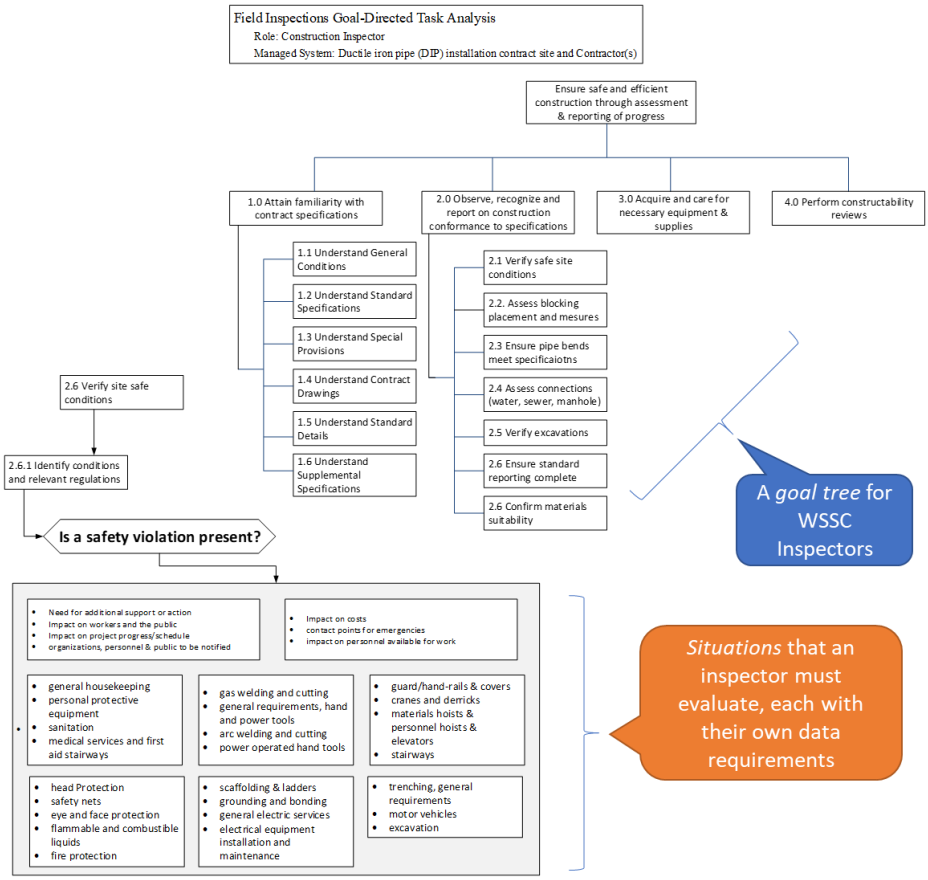

Figure 1. Results of Step 1 analysis showing relevant goals, situations and the data required.

Steps 2 & 3 resulted in several BPMN models that helped clarify and prioritize important issues that could be addressed in an inspection process improvement program. Existing document management automation is effective at report creation, which is followed by the important step of evaluating the report for issues that need to be addressed. This step can result in the need for additional information if safety violations or other project issues were identified. Moreover, the follow-up processes can be extensive, are critical to keeping the project on-time, involve additional reporting. The decisions related to issue identification require expertise that currently resides in the inspectors or contractors. Inconsistent application of this knowledge can result in delays and possibly unsafe construction sites.

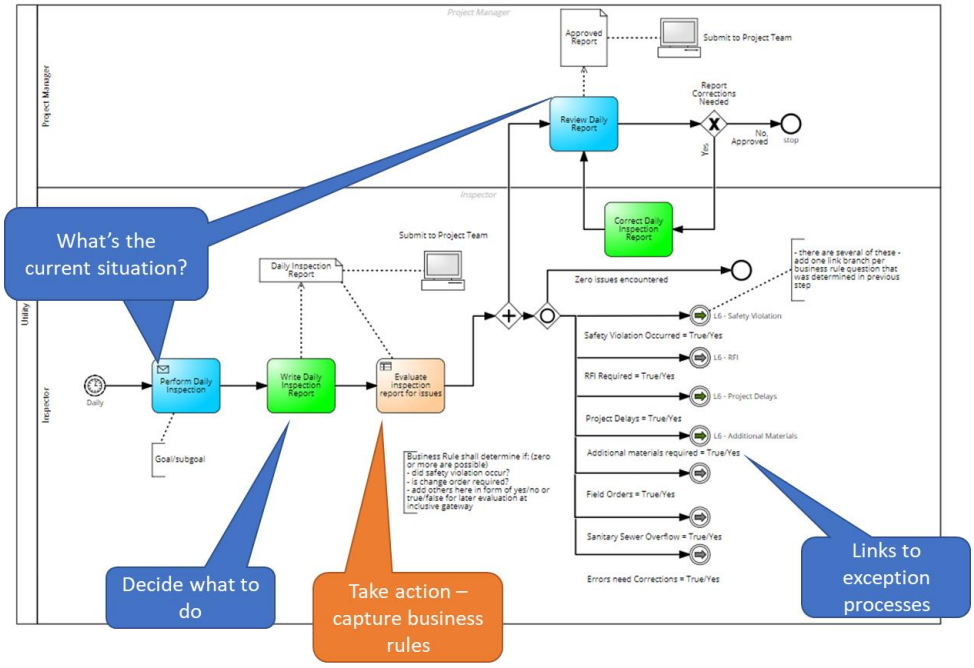

Figure 2. Performing daily construction inspections at WSSC - As-Is model.

Initially, 7 different processes were identified for handling inspection reporting issues including safety violations, request for additional information, identification of project delays, requests for additional materials, request for additional field orders, reporting of sanitary sewer overflows and, request clarification or error correction. An analysis of the data required for each of these processes showed that through collection of additional information on contactor performance, the process could be simplified into two follow-up processes: general project issues and safety violations. This simplification highlighted better ways to improve the data model, improve information tracking, eliminate tasks that were unnecessary or inefficient and provide a process design that could be implemented in WSSC's workflow automation tool.

Step 4 generated the To-Be model and design for the workflow automation process that will be implemented at WSSC.

Successful Strategies

WSSC adopted a workflow automation tool in 2010 to better manage the inspection and reporting process. As discussed earlier in this report, processes need to be revisited over time to ensure that the original goals of the automation still are realized. This project has given WSSC the opportunity to work to streamline and update the daily inspection process and implement additional features. The process issues follow up process will assist technical contract managers in

tracking issues that are raised on the job site but need additional follow up. This work has also highlighted that we need to revisit processes created for other issues, such as change orders and project close out, to ensure that the process is still working within the ever changing landscape of internal and external business rules.

Business process modeling with decision automation is a flexible solution that solves several problems for WSSC. Current process improvement practices apply techniques such as process drawings or depictions (e.g., in PowerPoint or Visio), manual data analysis, and written procedural manuals (e.g., standard operating procedures, etc.). In the past few years WSSC has implemented an automated document management system and this has demonstrated the potential for significantly improving efficiency.

Conventional business process improvement methods are effective, but may also result in loss of information, knowledge concentrated in certain personnel, inconsistency in KPI definition and evaluation, and longer time to achieve improvement goals. In contrast, business process and decision automation address these problems by improving clarity in the process description, definition of roles and responsibilities, identifying where gaps exist, as well as standardizing and rationalizing a data model, improving communication between affected parties, capturing knowledge, evaluating KPIs and encouraging proactive thinking.

BPMN models are tools that require a formal methodology to make them useful and the UAIM provides for these needs. Mapping the business process to specific goals gave insights into the appropriate KPIs that measure progress towards those goals. The process descriptions along with goal mapping shows the situations of which each role needs to be most aware at each point in the process. With tasks and situations understood, the data needed for these tasks are easier to understand and to organize. Business rules that drive decisions in the inspection process now can be logically centered at points in the process, and this helps to isolate those decisions, capture what's needed to decide what to do and when to take actions.

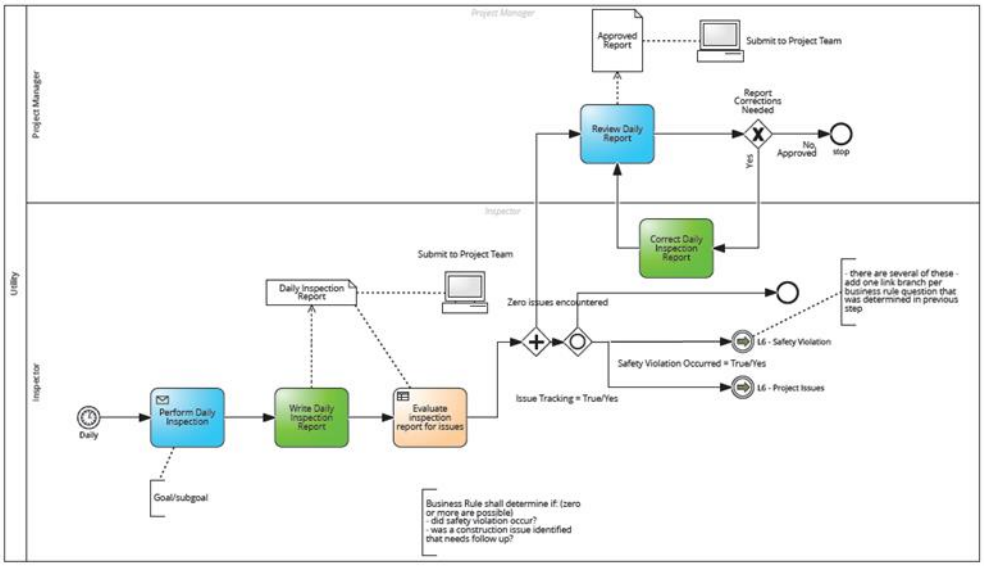

Figure 3. Construction Inspection process - To Be model

The project contributed to improved understanding of the Water Sector Value Model (WSVM). The UAIM project identified a structure for the WSVM that includes an Acquire, Construct Assets

(ACA) process with several levels of processes hierarchically contained within in the ACA process. The Construction Inspection process analysis identified an efficient model for this process at level 5 in the WSVM.

Lessons Learned & Ongoing Challenges

The final step in the project is to implement the identified changes at WSSC. Key lessons learned relate to the way information was collected to develop an improved process, understanding the

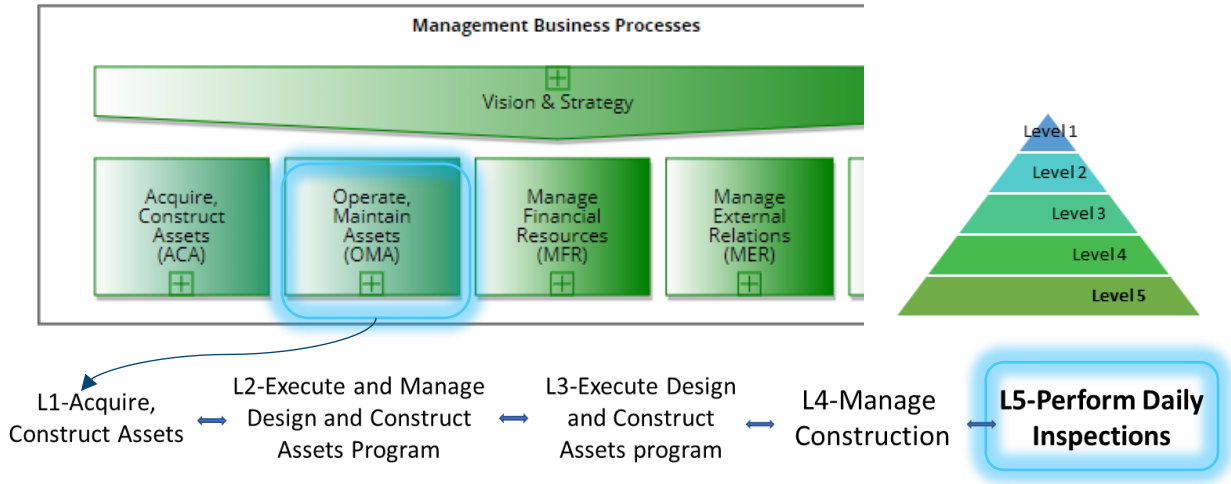

Figure 4. Location of the Construction Inspection Process in the WSVM.

dynamic nature of construction inspection, and the additional capabilities for process improvement through application of UAIM (described in the preceding sections).

Designing the improved process required that we first understand all reports that needed to be generated. This was a process of itemizing both the reports and the data required for the report. The reports served as drivers because they support the end goal of informing impacted parties (roles) and initiating actions. The reports alone don't determine a rational data model; however, when combined with the business processes and mappings to the most important goals, an appropriate data model arises; one that supports the business process, related tasks and goals.

The project also highlights the dynamic nature of business processes. Processes are never static and need to be reviewed on a frequent basis to ensure that they still working for the end user. The reason for this is that the system under management – the construction site and contractors – is always changing. WSSC learns more as projects are worked and completed, contractors change and become more efficient with additional jobs, the various stakeholders understanding of value changes and processes need to adapt accordingly. This feature suggests a greater need tor analysis tools and methods like those provided by with the UAIM.