Needs Assessment and Workflow Analysis of Baltimore County Department of Public Works Operational Procedures for Managing Flood Reports

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Abstract

The Baltimore County Department of Public Works (BCDPW) Storm Drains Engineering Department seeks a standardized operational process and technical system that can be used within Cityworks, an asset management system used to help manage their public assets, work activities, and business process. This standardized operational process and technical system would assist BCDPW in systematically evaluating incoming flood complaints and help determine the most resource-efficient approach to alleviate and respond. A process and system should accurately depict the exact nature of an incident as well as rate and prioritize the incident. This approach should also guide inspectors on the necessary resources and next steps to effectively and efficiently resolve the incident.

This report incorporates suggestions to improve operational procedures regarding the CityWorks management system. The project scope is strictly limited to conducting an assessment to resolve the needs and wants of current procedures versus desired procedures. Accordingly, the final deliverable will not include designing any technology but will include a descriptive analysis of the database or processes envisioned. Finally, we will be developing suggestions working within the ideal situation where requests are made to one group within BCDPW and their procedural steps of using the CityWorks asset management system.

Project Description

This project consisted of performing need assessments interviews and conducting workflow and business process analyses that will help implement a refined operational procedure for flood complaints. The new procedure will provide administrative staff with a more effective and accurate approach for resolving flood complaints. Additionally, a new procedure should help determine how to rate and prioritize these complaints and make it easier for inspectors to determine how severe or complex a flood is.

Activities in this project include:

- performing needs assessments with BCDPW administrative staff, inspectors, and CityWorks engineers
- conducting a workflow and business process analysis of administrative staff, supervisors, and inspectors
- analyzing client supplied data and the CityWorks platform respective to business needs
- creating a report on organizational needs and assessment of current work practices
- providing recommendations and reports, with justifications, on process refinements.

This project was developed with the goal to help improve the operation process for the Storm Drain Engineering Department of BCDPW, which uses the CityWorks asset management system. The project was phased to facilitate development of key recommendations:

- Requirements interview and document
- Project plan
- Interviews with BCDPW personnel and gathering additional artifacts
- Qualitative analysis of research
- Needs assessment
- Recommendations document

Evaluation Process and Methodology

To better understand the CityWorks system, the team began by researching the CityWorks platform with the goal of identifying a standard operating procedure for their software. The team then conducted interviews with staff who use the system. The team started with an introductory interview with a primary contact to get background information on issues or problems. With those insights, the team then organized interviews with additional offices to gather more information.

From these interviews, the team gathered recordings, transcripts, written notes, and other artifacts giving more detail about the CityWorks system and BCDPW workflows. These artifacts informed a large-scale inquiry of the CityWorks implementation that included a qualitative analysis and commentary about issues with the asset management system and related workflows. The commentary is based on the team's interpretations of system procedures, workflow diagrams, and additional documentation of CityWorks operational procedures. The qualitative analysis identified issues expressed by interviewees in recordings and transcripts. Their comments were then condensed into meaning units that clarified core issues. The meaning units were categorized into codes—groups that contained other meaning units discussing similar issues. Those codes were further grouped into larger themes that focused the main areas for improvement.

Using the results gathered from this inquiry, the team produced recommendations that could be implemented now and in the future at different levels in the client's organization. While developing the recommendations the team was mindful that the CityWorks system is still in the early phases of its deployment. The recommendations were also drafted knowing that BCDPW is still transferring and modifying workflows and operating procedures into CityWorks. The recommendations highlight five key problems, each accompanied by a recommendation and followed by methods and potential effects of implementation.

While conducting the needs assessment, the team faced limitations. Due to COVID-19, the team's only way contact the clients and relevant parties was through email, phone, and virtual conference tools. While response time to emails was adequate, response time when requesting artifacts was sometimes lengthy or there was no response at all. Also, given that the team's primary contact was in the Storm Drain Designs group, the recommendations were focused to issues in that group. The team also had to consider that the CityWorks Task Management System was still in its initial launch phase. As a result, some features of the system were unavailable for analysis during the inquiry and so weren't considered.

Deliverables and Findings

In the early stages, the team researched CityWorks and departmental processes to better develop recommendations for BCDPW. Specific stages of the project were outlined to provide assessments and analysis. A Project Gantt Chart allowed the team to understand the project's timeline and the steps needed to finish each deliverable on time. Furthermore, we completed a Background Research & Context Analysis, which consisted of a SWOT analysis, description of stakeholders, constraints, and transition plans.

Through the interviews, the team gained a better understanding of CityWorks and the Storm Drains Engineering group and their goals for the future. We produced a Requirements Interview & Document that consisted of facts and assumptions, current problems, use case diagrams, function/non-functional requirements, new problems, risk mitigation, and migration toward the new product. This document allowed us to visualize a solution while considering concrete data. Additionally, a Project Plan included specific criteria for the final report/presentation and a project schedule that offered a detailed plan for milestones and task start and end dates.

A Mid-Semester Presentation allowed our client to see where we were in the process and how we were conducting our analyses and offer feedback on how to improve and simplify future reports. This guided work on our next task, which was qualitative analysis of the interviews, artifacts and workflows. Timothy Rainsford, an instructor and PhD candidate at UMD's I-School, helped us develop a clear direction for analysis methods and the kind of information we should seek. The team created an Excel sheet for the Qualitative Analysis of Interview Transcripts, which revealed the themes that informed the recommendations—ambiguity, communication, departmental silos, input issues, and system oversights.

The Organizational Needs Assessment gathered issues from the client and our analyses, was presented to the client for further input, and informed our next steps—possible solutions and prospective recommendations. The work came together in a Final Presentation for a virtual meeting that will cover major deliverable items, major findings, and future steps. It is a counterpart to the Final Report with the intention of breaking down the work and findings and explaining the deliverables. The presentation will be supported by the deliverables created in the course of the project and will allow us to answer questions about our process. After the presentation, a recording will be available, as will all project materials accompanying the final presentation.

Recommendations

The recommendations were developed from criteria outlined in the Recommendations Report. We then chose five key problems to address, and developed the following suggestions to improve operational processes for the BCDPW:

● Schedule an Office of Information and Technology-led demo and walkthrough of the CityWorks management system as it pertains to Storm Drain Design's business process.
● Require that all incoming referrals include the contact information of the initial incident reporter.
● Implement a system in CityWorks to filter Storm Drain Design work orders and service requests that pertain only to them.
● Analyze previous data on flooding incidents attended by each respective group to determine themes and trends unique to each group's data; then use that data to develop criteria that informs ownership designation for future flood incidents.
● Develop formatting guidelines for referrals to increase efficiency when processing information from different mediums.

Further details on the problems addressed, methods of implementation, and possible effects are discussed in the Recommendations Report.

Future Work

The Storm Drain Design group has noted that additional information regarding magnitude and ownership of the problem could be helpful in completing work orders referred to them. The recommendations listed above help alleviate this issue, but it would also be prudent to explore an operational process for referrals within CityWorks. The first step would be to have groups outline key information they need or would be helpful in a referral from another group. The goal would be to work with Baltimore County's Office of Information Technology (OIT) to implement a workflow process specifically for referrals that would incorporate the group's criteria into fields that could be filled out at the time of referral. If implemented, it could provide additional information at the time of referrals, while also helping centralize the referrals in one place with a consistent format.

Adopting such a method is limited by the fact that some BCDPW groups haven't implemented CityWorks into their operational processes. However, a workflow that creates a work request, selects a group for referral, and includes criteria could be a useful way to introduce CityWorks to these groups. The goal is not to rush the adoption of CityWorks across the BCDPW, but to use it for the referral process between groups. It would initially require training the individuals in each group who are tasked with making referrals, though this might vary based on the groups' organizational structures and the way they currently process referrals. An additional benefit is that this would provide a more reliable workflow moving forward as the CityWorks system is adopted across BCDPW. Eventually, all of these processes will be tracked by the CityWorks asset management system, so at a certain point, a similar transition to the referral process outlined above will be necessary. Beginning this part of the transition earlier could help reduce the time spent processing referrals from different input sources and following up to gather needed information.

Additional future steps include reaching out to Baltimore County's Bureau of Highways to better understand their incident referral process and general workflow. Likewise, 311 operators should also be contacted to gather information on their referral processes.

There are already some prioritization criteria within CityWorks, however, further research on this topic and an analysis of sample flood data might reveal patterns that can inform new criteria. These steps will help shape the eventual development of a refined workflow for CityWorks referrals.

Appendix

Appendix A: Deliverables

Requirements Interview & Document

Project Plan

Organizational Needs Assessment

Qualitative Analysis of Interview Transcripts

Recommendations Report

Final Presentation

Appendix B: Additional Documents

Background Research & Context Analysis

Project Charter

Project Gantt Chart

Mid-Semester Presentation

Appendix C: Contacts

Nora Banner: Business Analyst, Baltimore County Government
Joseph Consentini: Baltimore County Program Director
Sheldon Epstein: Chief Engineer, Baltimore County Bureau of Engineering and Construction
Kevin Flynn: Baltimore County Office of Information Technology
Mike Harner: Management Analyst, Baltimore County Department of Public Work, Bureau of Utilities
John Morris: Business Relationship Manager, Baltimore County Office of Information Technology
Sandi Olek: Maryland Department of Natural Resources
April Oteyza: GIS Technician, Baltimore County Department of Public Works
Timothy Rainsford: Instructor and PhD candidate, University of Maryland College of Information Studies
Radu Zamfirache: Engineer and Project Manager, Baltimore County Bureau of Engineering and Construction

Glossary

BCDPW: Baltimore County Department of Public Works

CityWorks: GIS-centric solution for public asset management, using Esri ArcGIS to help communities work smarter and better serve residents

GIS: Geographic Information System

References

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