Agility and Resiliency: A Winning Combination!

Agile Case Study- Watershed Master Plan Program for Flooding Resiliency [1]

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Introduction

The City of Fayetteville, North Carolina, successfully incorporated Agile philosophies and methodologies into a multi-million-dollar planning program for flooding resiliency. The high level of complexity due to the unknowns, size, distributed team, aggressive schedule, and other characteristics understandably created challenges, yet operating with agility yielded remarkable successes. As noted by others (San Cristóbal, J. R et al, 2018) traditional project management tools and techniques are insufficient for complex dynamic projects. This article reviews how the adoption of an Agile philosophy combined with iterative and adaptive tools contributed to these successes. Agile has been described as a way of 'incrementally delivering change to get the earliest possible benefit, get feedback early on what works, and change direction accordingly' (Wernham, 2012). The management aspects discussed in this article that supported the program include adapted Agile principles, the framework which includes iterating and adapting frequently, and continuous collaboration.

Background

City of Fayetteville leaders embarked on this ambitious program in 2019 to better understand the magnitude and severity of flooding across the entire city and use that knowledge to proactively develop stormwater flood mitigation projects. Leaders understood that a comprehensive evaluation would support resiliency by providing a portfolio of prioritized projects to the Capital Improvement Plan (CIP) for both short-and long-term implementation. The goals were to apply resources equitably across the city, identify creative regional-scale projects, and leverage inter-governmental and cross-departmental collaborations. The foundation was established within four years to include an intensive rebuild of the city

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stormwater geodatabase, a city-wide stormwater asset field survey, parallel watershed modeling efforts by several consulting teams, scoring and ranking flooding concern areas, and the development of over 200 proposed solutions. By 2023, four out of 15 watershed master plan studies were completed. Designs for selected projects from those studies were begun and four additional watershed master plan studies initiated. Creative cornerstone projects were developed and state and federal grant funding applications submitted to leverage city funds. This program supports the city's goal to become more resilient (Lanier, 2023).

Adapting and applying Agile principles (for original Agile Principles refer to the Agile Manifesto, Fowler and Highstreet, 2001) helped overcome challenges inherent in this complex program. The continuous collaboration among all team members with dedicated involvement by the Sponsor was crucial. Because the team was distributed geographically and across corporations and local government, establishing communication and trust was essential (Eckstein, 2010; Thuerbach, 2014). This need was supported by reflecting regularly to adapt and respond to change, show continuous progress and ensuring alignment with the vision by delivering measurable results, and honoring the commitment to value people over process.

Adapted Agile Principles

The adapted Agile principles include the following:

1. Build projects around motivated individuals and trust them to get the job done.
2. The highest priority is to satisfy the customer through early and continuous delivery.
3. Project team welcomes changing requirements.
4. At regular intervals, the team reflects on how to become more effective.
5. Pay continuous attention to technical excellence.
6. Simplicity is essential. This is the art of maximizing the amount of work not done.
7. Face-to-face conversation is the most efficient and effective method of conveying information.

These principles are woven into descriptions of the program's framework and management aspects. While the program is multi-faceted, this paper focuses on the watershed master plan studies and the delivery of proposed solutions to the City Council (Council).

Framework

The management framework is described here through an Agile lens. A vision was created, the team selected, and an iterative and adaptive process implemented.

Create a Vision

The original high-level vision was to develop proposed solutions for the CIP within 5 years across the city and to explore creative regional-scale creative solutions. Developing the vision for products was iterative and adaptive as well, and often difficult to verbalize, which required multiple iterations before the team landed on an acceptable result. Boehm (2000) coined this process as IKIWISI, or "I'll Know It When I See It".

Build the Team

Adhering to the Agile principle of '*build projects around motivated individuals and trust them to get the job done'* was imperative. The size of the program coupled with an aggressive schedule required a large team. Available city staff was limited in capacity, consisting of the Sponsor, Internal Program Manager (IPM), and two modelers, requiring that much of the work be outsourced. The outsourced team consisted of an External Program Manager (EPM), a consultant team for each watershed study, and two stormwater survey firms. A brief description of the roles and critical functions follows.

The **Sponsor** carried the overall program vision, from watershed studies to other internal initiatives including flood early warning system, future modeling needs, and instrumentation to validate near-term modeling results and to support future needs. The program's success hinged on the Sponsor being dedicated, closely involved, and politically astute.

The **Internal Program Manager** (IPM) worked closely with the Sponsor and the EPM strategizing on schedules, work tasks, reviews, budget, and other issues that necessitated city support. The IPM ensured city perspectives and needs were understood including funding cycles, council deadlines, and contractual aspects. The IPM facilitated cross-departmental collaborations to validate study results, vet proposed solutions, and mesh products from the studies with city operations.

The **External Program Manager** (EPM) served as a Bridger between the **Technical Team** and the Sponsor and IPM. This role provided quality control, maintained programmatic guidance

including the Consultant Management Standards Manual (CMSM) and templates, tracked and managed the budget/schedule/scope of the consultant teams, and conducted high-level studies including Downtown Flood Assessment, Storage Screening, and Watershed Prioritization.

The **Technical Team** included ten consultant teams conducting surveys of stormwater assets and conducting the watershed studies (stream assessments, hydrologic modeling, hydraulic modeling, identifying areas of flooding risk, and developing proposed solutions). City staff served on the technical team conducting modeling, reviewing deliverables to ensure consistency across deliverable products, and testing the new stormwater geodatabase for compatibility with the city work-order system.

Select the Process

The program was built around an iterate and adapt approach, an approach that is used to support complex programs such as this with many unknowns, large size, distributed team, and other attributes of complexity (Davis, 2013; DeCarlo, 2004; Parente, 2015).

Steps taken to form the program are similar to those used in other complex projects (Lanier et al, 2018). A high-level roadmap was built first, then the following steps were repeated continuously over the shortest reasonable intervals: (1) break the known elements down into manageable chunks, (2) frame them up and prioritize, and (3) iterate and adapt. Continuously iterating and adapting helped the team understand and flesh out program elements over time, contributing to a better understanding of next steps.

Break the Work Down

The program offers many examples of where the known elements were broken down into manageable chunks. Project managers are familiar with a work breakdown structure in traditional waterfall projects, where big tasks are broken down into smaller tasks (PMI, 2021). A more just-in-time planning approach was needed for this complex program where results would continuously emerge that would inform the next steps.

One example was the scoping for the studies. The studies could be scoped through assessing the flooding problems but until those concern areas were identified, developing solutions could not be scoped. This breakpoint was used to develop a phased contract mechanism, with Phase I scoped through the task of identifying concern areas. Phase II was scoped once input was provided on which concern areas should move forward with developing proposed solutions.

Frame Up

A schedule was built to illustrate and convey the survey and study time frames and anticipated delivery dates for projects to the CIP and was continuously adjusted as necessary. This tool was used to prioritize work to be done – necessary at many scales – focusing on the non-negotiable milestones and then working back to understand and identify the tasks to meet the first milestone without losing track of those long-term initiatives that can be incrementally developed.

As an example of just-in-time planning, another Agile principle adapted for this program is '*The highest priority is to satisfy the customer through early and continuous delivery.'* The customer in this case was Council. Instead of waiting for final reports, the decision was made to bring projects to Council when a substantial portfolio from several watersheds was available. Early deliveries showed that progress was being made and allowed for redirection if needed. Strategic capstone projects were brought to Council as soon as possible to ensure sufficient time to apply for grants and to program project costs into budget planning for the CIP.

Iterate and Adapt

Not knowing everything upfront required an iterative and adaptive process. A prime example of 'iterate and adapt' in action was the development of the CMSM, the study guidance document. While some guidance criteria were industry-standard and straightforward, others emerged throughout the more extensive studies and from the consultants' varied experiences using fairly new-to-stormwater modeling software. A small pilot study was selected to test concepts and provide results that could be used in developing the CMSM initially and test templates for reporting and visualizing results.

Adhering to the principle '*the project team welcomes changing requirements*' was taxing initially, mostly due to the speed at which changes were identified and reversals of earlier decisions as additional information became available. Over time, the chaotic nature of the program was smoothed out and changing requirements, while still emerging, were fewer and easier to welcome.

Following the principle of '*at regular intervals, the team reflects on how to become more effective'* the team used a variety of meetings and brainstorm sessions for reflection. Supportive meetings included monthly progress meetings with the technical teams and bi-weekly program progress meetings. Interim meetings between the technical teams and the EPM served as status update meetings and an opportunity to reflect upon and improve technical processes.

Retrospectives, a brainstorming tool, were introduced to pull the entire team together to discuss the process, identify issues, and discover leading-edge value-added aspects. The mid-project whole team Retrospective led to a Technology Workshop where value-added improvements were further explored.

The Quality Assurance/Quality Control workshops (QA/QC's) conducted at each interim deliverable milestone allowed the team to review and adapt technical processes as needed. The QA/QC's also ensured the team paid '*continuous attention to technical excellence.*' A QA/QC checklist was developed incrementally as each interim milestone of the first round of studies was met: Survey, Stream Assessment, Hydrology Modeling, Hydraulics Modeling, Concern Areas Delineation, Proposed Solutions Development, and Final Deliverable.

Standardized deliverables were required from the multiple consultant teams working in parallel. One way to ensure technical excellence and also '*maximize the amount of work not done'* was to develop tools that all the consultant teams could use which eliminated the need for them to build their own. Example tools included templates for the various exhibits and reporting elements, and scripts to extract data from models to populate the geodatabase.

Continuous Collaboration

Valuing people over process requires frequent open communication with team members across all levels, from informal conversations to intentionally structured meetings. Ensuring productive communication included inviting the right people to meetings, selecting the best format for the meeting, and providing immediate lightweight documentation.

Continuous collaboration surfaced potential risks and issues early on, which provided the ability to redirect or adjust before too much time had elapsed. The frequency and type of communication needed varied. For example, while one Agile principle is '*Face-to-face conversation is the most efficient and effective method of conveying information,' meetings* became virtual by necessity during the COVID-19 pandemic. Turning on cameras and informal chat while waiting for all participants to arrive helped. Sharing notes visually during meetings helped build shared understanding. Documentation in the form of bulleted notes - with discussion, action items, decisions made, and next steps - was distributed (immediately after meetings). Although the team discovered many benefits of meeting virtually, including time and cost savings, face-to-face meetings were preferred after the pandemic when possible.

As Margaret Wheatley (Wheatley, 2006) reinforces, 'The work of any team or organization needs to start with a clear sense of what they are trying to accomplish and how they want to behave together'. In this program, the IPM and EPM informally adopted values to be transparent and honest with each other and the entire team, show respect, work with integrity, and hold a win-win attitude. The IPM and EPM held frank discussions whenever one veered away from these core values. The program benefited from these leaders operating through a shared value system.

Summary

Overcoming the challenges inherent in the city of Fayetteville, NC, complex Watershed Master Plan program included adopting an Agile philosophy, building a management framework for iterating and adapting at multiple levels and scales, and ensuring continuous collaboration. An engaged Sponsor, strong program management skills both internal to the city and external, and highly qualified and motivated technical team members (with their own strong suit of project management skills) were also critical to the program's success. The commitment to value people over process supported the team throughout.

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