

A case study for exploring project management methodologies

John Russomano
Troy University

Steven Sherman
Troy University

Benjamin Larson
Troy University

Ted Mills
Troy University

Jeffrey Bohler
Troy University

Abstract

Project management is an essential skill sought after by many organizations. This case focuses on exposing students to selected project management methodologies and then allowing them to utilize critical thinking to argue for the appropriate methodology for a given situation. Students will begin their learning by exploring the methodologies and then asked to evaluate a request for proposal for the Computerized Criminal History (CCH) System Modernization Project posted by the State of Alabama. The students will then be required to discuss the appropriate project management style for the project and respond to other relevant scenario-based discussion questions.

Keywords: Project Management, Agile Development, Waterfall, SCRUM, Kanban, Scrumban, Extreme Programming, XP, Scrum/XP

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Introduction

Project management is an integral element when organizations pursue major undertakings. The selection of the appropriate project management methodology approach and style will often vary by organization when considering specific needs and factors. An understanding of how best to assess the factors is an essential element when selecting the appropriate methodology.

Students in project management courses may benefit from exposure to the various project management styles and techniques. This knowledge may be instrumental in understanding the different methodologies and gaining experience in determining the style appropriate to a project's needs.

The purpose of this case study is to explore selected project management methodologies and apply this understanding to make selection decisions in response to a request for proposal by the state of Alabama. The objective is to allow students to explore and argue which project management style is the most appropriate when considering different scenarios. The case study will begin with a general description of various projects management styles, followed by the criteria for selection, and, finally, the details of the project and discussion questions.

Project Management Options

This section explores and highlights selected project management methodologies. The list is not meant to be an all-encompassing and limited to the more common project management options used for government case projects as suggested by our research. The following methods explored include traditional waterfall approaches and practices and popular Agile Project Management Techniques used in the State of Georgia including Scrum, Kanban, Extreme Programming (XP), and the hybrid methods Scrumban and Scrum/XP (Gorgadze, 2021).

Waterfall

Traditional software is an engineering methodology that often relies on a sequential set of events with each event building upon the results of another. In engineering practice, the term Waterfall is the generic name assigned to most sequential software engineering methodologies (Awad, 2005). Waterfall provides a foundation of control and structure when managing linear and stable projects.

Variations of traditional sequential design methodologies exist. However, each design shares commonality in requiring a significant effort to deliberate and complete derivation of static requirements up front. This detailed requirement planning follows with a highly deliberate design effort and rigorous testing then concludes with validation procedures.

Advantages

The primary strength of the Waterfall methodology centers on the discipline of project management. Waterfall projects offer a standardized approach to planning which results in structure and promotes data-driven decisioning (Agbejule & Lehtineva, 2022). The standardization adds value and minimizes the need for having to interpret use of the

methodology enabling teams to focus on executing the project. The approach promotes extensive planning upfront to minimize downstream development challenges and potential rework.

Disadvantages

Waterfall and other traditional forms of project management rely heavily on the project requirements. The latter may not be fully known at the onset of a project which can lead to extensive planning periods that may delay the start of the project. Also, end users may not be familiar with the software engineering processes, and therefore unschooled in translating user needs into requirements and specifications which could also lead to project delays.

This challenge during the initial planning steps may render any sequential methodologies where time-to-market is critical inadequate. The lack of insight on the process may result in a poor foundation for development, and inciting problems that may not be known until testing and validation. The recourse is costly rework which requires repeating the development process and updating the software product based on the lessons learned.

Conclusion

Waterfall and traditional project management methodologies are quite effective when well-understand set of requirements at the onset of a project exist. The methodology may experience challenges when requirements are unclear and may result in rework. The potential outcome of multiple iterations and rework may introduce time, budget, and quality issues as the development effort is exhausted and testing rushed. The rework is often costly and likely to compromise profit margins and challenge an organization's ability to compete.

Scrum

Scrum has emerged as a popular framework for managing projects. The methodology offers flexibility and an iterative approach to project management that focuses on collaboration, communication, and continuous improvement (Alami & Krancher, 2022). Teams engage closely and typically include end users and stakeholders throughout the development process.

The basic idea behind Scrum is that a team works together in short cycles, called sprints, to accomplish specific goals. A typical sprint might take two weeks. At the beginning of each sprint, the team meets to plan what they will work on during the sprint. They then work together to complete the tasks they have set for themselves, holding regular daily meetings to track their progress and adjust their plans as needed.

Advantages

Scrum emphasizes transparency, so everyone involved in the project knows what is happening at every stage. Scrum promotes teamwork and communication, with the team working closely together and sharing responsibility for the success of the project. Scrum offers a highly collaborative approach with an emphasis on team communications and the product owner has full visibility of the development process, and the delivery of the product. Incremental phases seek to ensure higher levels of quality control.

Disadvantages

Scrum approaches may lack predictability due to continuous changes, the development of a feature that may not be useful, and the necessity of a dedicated Product Owner to manage the backlog. The unpredictability may be uncomfortable to end users who want to know design details and expect a feature-laden end product.

Conclusion

Scrum offers a fundamental and adaptive approach when requirements are iterative and prioritized relative to perceived value. The methodology requires a high degree of collaboration which may be challenging to newly formed teams and extensive level-setting of expectations with end users. Scrum can promote speed-to-market but may prove challenging when engaging on complex projects with multiple functional works-streams.

Kanban

Kanban is a popular method for managing work and improving productivity. It originated in Japan in the 1940s and adopted by organizations around the world in recent years. The basic idea behind Kanban is to visualize work as it flows through a system. Visualization is a key differentiator between Kanban and the more traditional project management methodologies. A Kanban Board is typically a whiteboard or digital tool that shows the status of each task or item in a process and helps teams visualize the requirement. Teams use cards or post-it notes to document a task and then navigate and monitor the activity as it progresses across the board from one stage to the next.

Advantages

Kanban emphasizes limiting work in progress, which means that the team focuses on completing a set number of tasks concurrently rather than initiating larger chunks of work that may prove challenging to finish. This approach helps to reduce bottlenecks and improve flow through the system.

Another key aspect of Kanban is continuous improvement. The team regularly reviews their process and looks for ways to make it more efficient and effective.

Disadvantages

Kanban lacks emphasis on deadlines, metrics, and reporting. These limitations may introduce ambiguity about the project's overall direction and the danger of resource burnout when there are no limits or deadlines for work in progress. Kanban centers on optimizing workflow which may pressure the project budget and timeliness.

Conclusion

Overall, Kanban is a simple yet powerful method for managing work and improving productivity. By visualizing work, limiting work in progress, and focusing on continuous

improvement, teams can work more efficiently and effectively. Kanban may introduce risks to budget and timelines which could mitigate the efficiencies offered by the methodology. Project exploring solutions and innovation may benefit from a Kanban approach.

Extreme Programming

Extreme programming (XP) is a project methodology and style that relies on small iterative releases and rapid software development. Small teams consisting of a pair of programmers and representative customers work to supply small iterative changes for a product. These small projects represent stories in the XP process. Teams select from the use cases that are prioritized by the customers and used to guide the order for processing individual use cases through development, testing, and implementation in short periods of time (Beck, 1999). XP programming emphasizes rapid development and identifying defects during testing and validation. The essence of XP is speed and, while quality is important, developers rely on the testers to find bugs and defects for correction prior to validation.

Advantages

Work follows the traditional steps of development but simultaneously in real time as paired programmers can work on small projects that are immediately evaluated and sent for testing by the programmers and the customer. This approach enables immediate review of the results for each iteration within a brief period which promotes simplicity of the process and cost savings (Saleh, Huq, & Rahman, 2019). The active engagement and embedding of the end users or customers within the team enables constant feedback to help improve the project's usefulness and adoption.

Disadvantages

The XP methodology does not follow formal project management and can only accommodate small team sizes. Once unit testing and validation is complete, the code is immediately implemented. This approach is not appropriate for larger projects as the immediate changeover to production may introduce concerns over integration.

As small projects with working code are prioritized, issue documentation can be limited and result in repeating similar issues in future development efforts and less efficient code being implemented which may mitigate the quick release of new functionality.

Conclusion

XP leverages dedicated collaboration of developers and users to enable rapid development of code on small and highly iterative development efforts. However, organizations can find initial implementation of XP difficult as the methodology often requires a culture and individuals with advanced technical skills. XP is appropriate for smaller efforts requiring extensive coding but less complex in terms of the broader project scope.

Hybrid Agile Methodologies

Overview

Hybrid Agile represents a form of project management that incorporates the mindset of Agile thinking while leveraging different combinations of Agile methodologies. Hybrid Agile methodologies provide a means for having options and flexibility when addressing varying requirements, applications, or phases of a project (Papadakis & Tsironis, 2020; Reiff & Schlegel, 2022). The combination of methodologies may promote a higher likelihood of success relative to the development needs of the project.

For example, the use of Scrum may be acceptable when iterating and developing a new software product but lacks the rigor and structure offered by Kanban necessary for developing workflows in a call center. Flexibility is among the benefits associated with Hybrid Agile methodologies.

Scrumban (Combining Scrum and Kanban)

Scrumban represents the combination of Kanban and Scrum. The methodologies are both in the agile family and complement one another.

Advantages

Scrumban offers the value of visualization and structure. This value emerges when combining Kanban and Scrum to use Kanban as a visual management tool to help manage the Scrum backlog. Kanban can be used to track the progress of individual tasks within the Scrum framework. For example, a Kanban board can be used to visualize the status of user stories, tasks, and bugs during the Scrum sprint.

Another approach is to use Scrum as a framework for planning and conducting sprints, while using Kanban to manage the flow of work between sprints. Kanban can be used to identify bottlenecks in the process and to ensure that work is flowing smoothly through the system.

Disadvantages

The inherent advantages of Scrum which relies on key teaming roles may counter Kanban where specific roles are of lesser importance. This conflict may challenge those on the team seeking role clarification and defined responsibilities or levels of structure that do not reside on typical Kanban teams (Mircea, 2019). Kanban is highly task-focused which may counter the Scrum approach of sprint planning based the prioritization of user stories (Mircea, 2019). These conflicting mindsets may compromise the workflow process which is based on velocity and content under Scrum and a stepped approach under Kanban.

Scrum and XP

Another popular Hybrid Agile methodology is the combining of Scrum and Extreme Programming (XP). Scrum / XP leverages the project management framework of Scrum with the accelerated programming approach inherent in XP to enable rapid but controlled development

efforts (Afshari & Gandomani, 2022; Flaviu, 2019). Scrum provides discipline which complements the simplicity and acceleration of development practices associated with XP.

Advantages

The strengths associated with Scrum and XP as standalone methodologies become highly complementary when combined under a Hybrid Agile approach. An application of Scrum / XP suggests a framework where elements including the daily scrum, planning meetings, and sprint reviews wrap around the key elements of XP including collective ownership, a straightforward design, and short but rapid iterations (Flaviu, 2019). This cocooning enables the XP practices of continuous integration and refactoring to commence with moderate controls and Product Owner and Scrum Master oversight.

Disadvantages

Conversely, the weaknesses of the individual methodologies in concert may result in a negative interaction that exacerbates the challenges of using Scrum / XP when seeking rapid development outcomes. For example, the well-intended documentation practices of Scrum may introduce levels of control that slow down and negatively mediate the intentional rapid development inherent in XP.

Similar to Scrumban, organizations should have a thorough understanding and proficiency in the use of Scrum and XP prior to using this methodology. Also, the Scrum and XP team mindset may conflict at times where Scrum promotes structure and control and XP centers on speed and post-development validation.

Factors For Electing a Project Management Methodology

The primary factors for selecting a project management methodology include consideration of an organization's project management maturity, aptitude change, and technical mindset when considering different approaches. Other considerations center on the importance of time, scope, and budget factors when considering speed-to-market, the availability of features and options, and managing costs. Additional considerations include the degree of customer and stakeholder engagement and documentation that is necessary to ensure the success of the project. A table with a summary of the methodologies and considerations for selecting a project methodology and approach is found in Appendix A.

Case Study

The purpose of this case study is to explore selected project management methodologies and apply this understanding to make selection decisions in response to a request for proposal by the state of Alabama. The objective is to allow students to explore and argue which project management style is the most appropriate to meet the needs outlined in the RFP and scenarios outlined in the discussion questions.

The project that you are evaluating is a government Request for Proposal (RFP) to computerize criminal history (CCH) in Alabama. The RFP may be found in the state's public

proposals site Request for Proposal Search (<https://www.alea.gov/sites/default/files/inline-files/AFIS%20RFP.pdf>) by searching for RFP 381 22000000009.

Scope of work requirements for the RFP are as follows:

0.2.1 Scope of Work

The objective of the RFP is to select a Contractor who will be able to provide, implement and support the State a CCH technology solution (CCH) with the following goals: # Provide CCH and web service standards based on open architecture that:

- # Enables implementation of state-of-the-art CCH applications and workflows including integration with the current Automated Biometric Identification System (ABIS).
- # Enables the incremental enhancement/addition/replacement of applications and workflows for any added functionality made available by the FBI, NCIC and III.
- # Allows selection of best-of-breed applications from different offerors; if appropriate, and provides for use of non-proprietary hardware, database software and open-standards application software interfaces.
- # Stores integrated subject arrest, charge and disposition data that enable online inquiries and reporting based on integrated subject criminal history data.
- # Be sized for planned growth.
- # Utilizes ANSI/NIST/FBI/NIEM record constructs.
- # Conforms to any applicable federal CCH standards.
- # Uses Commercial Off-The-Shelf (COTS) hardware and software. # Provides configurable administrative controls.
- # Manages the orchestration and transaction integrity of all sub-components of the CCH Solution.
- # Manages and controls person data using subject state and transaction (and other) identifiers as keys. # Provides efficient and cost-effective storage and retrieval.
- # Detects and notifies when systems, applications, equipment, or networks are interrupted or when there is a loss of power.
- # Provides an operational State-approved disaster recovery site or option.
- # Provides for migration of CCH data from already existing legacy State systems, wherein limited State resources will be available for this effort.
- # Provides management of the necessary network between the vendor data centers and the ALEA point of presence (ALEA CCH Datacenter).
- # The following sections of this document define the specific Statement of Work elements to achieve the above outlined operational goals.

Project management requirements for the RFP are as follows:

0.2.2 Project Management Vendor shall provide full project management, planning, monitoring, supervision, tracking and control of all project activities during the term of the resultant Agreement. Vendor shall employ project management industry standards and practices in the performance of all Work.

Project management deliverables for the RFP are as follows:

Deliverable 1.1 – Project Plans

Contractor shall provide 30 days for State's approval of the Project Management Plan [DEL-01] developed in State-specified version of Microsoft Project (currently 2010), which shall, at a minimum, include the following:

- 1) All Work described in this Statement of Work and elsewhere in the Agreement including:

- a) a. All Deliverables, including those referenced in the Pricing Schedule,
 - b) b. All Tasks, Subtasks, Deliverables, and other Work,
 - c) c. Associated dependencies, if any, among Tasks, Subtasks, Deliverables, and other Work,
 - d) d. Resources assigned to each Task, Subtask, Deliverable and other Work,
 - e) e. Start date and date of completion for each Task, Subtask, Deliverable and other Work,
 - f) f. Proposed State review period for each Deliverable,
 - g) g. Proposed Milestones.
- 2) Identification of all Contractor Key Personnel and Contractor Key Staff; including a resource management plan and the number of years of experience by role for each member of the team along with complete resumes.
 - 3) A Deficiency management plan, documenting the approach to Deficiency management, including methodology, recommended tool(s), and escalation process;
 - 4) Approach to project communications.
 - 5) A risk management plan, documenting the approach to risk analysis (e.g., the evaluation of risks and risk interactions to assess the range of possible project outcomes), risk mitigation (e.g., the identification of ways to minimize or eliminate project risks), risk tracking/control (e.g., a method to ensure that all steps of the risk management process are being followed and, risks are being mitigated effectively) and clearly establishing a process for problem escalation, to be updated, as needed, throughout the term of the Agreement;
 - 6) Initial identification of risks that may impact the timely delivery of the solution;
 - 7) Configuration and change management plan. Changes, in this context, refer to changing the functionality of, or adding additional functionality (e.g., changes to the project scope) to, any Solution component. The approach shall ensure that the impact and rationale for each change are analyzed and coordinated prior to being approved; and
 - 8) Deliverable Acceptance Criteria which shall be based on the terms of the resultant Agreement, including the Statement of Work and the actual tasks being completed, and shall include all documentation, whether stated in the SOW or not, that is consistent with good analytical practices, as determined by State. The contractor shall prepare and provide to the State a finalized Project Management Plan pursuant to Subtask 1.1 – Develop Project Plans. The Project Plan may be modified only if such modification has been approved in advance in writing by the State’s Project Manager. The Project Management Plan shall be the basis for the Project Schedule, which shall be updated upon finalization of the Project Management Plan and shall be attached to the resultant Agreement as an exhibit (Project Schedule). Contractor shall also develop an IMS, which shall include the activities required under this Statement of Work, as provided in Subtask 1.1 – Develop Project Plans.

The Deliverables required to be provided by Contractor under this Deliverable 1.1 – Project Plans shall.

include:

- # DEL-01: Project Management Plan
- # DEL-03: Integrated Master Schedule
- # DEL-07: Agenda
- # DEL-08: Presentation Materials

- # DEL-09: Minutes.

Discussion Questions

1. How would you assess this project in terms of scope? How might the project scope define the size of the project team assuming the effort is designed from scratch? What assumptions can be drawn from the RFP on the degree of collaboration necessary to deliver a successful result?

Research Suggestion: You should consider researching both the state of Alabama and CCH programs to identify criteria supporting assumptions about the complexity of the project in terms of potential usage of the system and the potential number of users (Provide references to support your recommendations).

2. How would you classify the timeline for implementing the project? Paced? Aggressive? Short-term? What criteria did you use to arrive at this conclusion?
3. The state recommends a Waterfall approach to enabling the RFP. Explore the project management methodologies including Waterfall and determine if you agree with this recommendation or would recommend a different approach. Be specific in sharing and supporting your conclusion.

Research Suggestion: Review the summary chart above describing the project management methodologies and use your answers to the first two questions as inputs as you assess and derive your conclusion.

4. How could the requirements in the RFP be modified to allow for the selection of an agile methodology?
5. Assuming that you are an organization that is experience in selling software as a service, but that you do not have a ready system to handle the requirements in the proposal, what project management development methodology(s) is most appropriate to deliver the new system? Please provide a chart summarizing the criteria and rationale for your recommendation.
6. Assuming that you are an organization that is experience in selling Software as a Service and have systems designed to specifically handle the requirements in the proposal in place with minor changes, how might this alter your original project management selection and recommendation?
7. Briefly outline the challenges that you believe exist with the project management methodologies that were not recommended for managing this effort.

Conclusion

The purpose of this case study is to explore selected project management methodologies and apply this understanding to make selection decisions in response to a request for proposal by the state of Alabama. The objective is to allow students to explore and argue which project management style is the most appropriate when considering different scenarios. The intent of the discussion questions is to guide students through a research-oriented approach to learning about project management methodologies and applying this new knowledge to scenarios based on real-world request for proposal. The intent is to ensure student learning extends beyond theory to include application of the concepts explored in this case study. This case study could be extended by allowing the students to plan the iterations and use project management software and artifacts.



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Appendix A

Considerations	Traditional Waterfall	SCRUM	KANBAN	XP	ScrumBan	Scrum/XP
Project Management Maturity	Maturity Levels Suggest Readiness for More Complex Methodologies					
High Proficiency	X	X			X	X
Moderate Proficiency	X	X	X	X		
Low Proficient	X	X	X	X		
Organizational Aptitude for Change	Aptitude Suggests Comfort w/Degrees of Planning Uncertainty					
Flexible		X	X	X	X	X
Neutral	X	X	X	X		
Inflexible	X					
Development / Technology Mindset	Development Mindset Represents Openness to New Approaches					
Traditional	X					
Flexible		X	X	X		
Innovative		X	X	X	X	X
Formulating	X	X				
Timelines and Deadlines	Market Pressures Require a Timely / Speedy Solution					
Highly Critical		X		X		X
Moderate / Incremental	X				X	
Low Relative to Scope / Budget	X		X			
Scope Planning	Features and Options is the Highest Priority for the Project					
Well-Defined Requirements	X					
Moderate / Iterative		X			X	
Exploratory / Staged			X	X		X
Budget Constraints	Managing Costs is the Highest Priority for the Project					
Rigid	X					
Moderate		X	X	X		
Flexible					X	X
Customer / Stakeholder Engagement	Stages of End User and Stakeholder Involvement in the Project					
Planning	X	X	X	X	X	X
Development		X	X	X	X	X
Testing		X	X	X	X	X
Ad hoc	X					
Documentation	Breadth and Depth of Project Documentation					
Extensive	X					
Detailed		X			X	
Targeted			X	X		X

(Table 1) Key decision factors for choosing a project management methodology