



VCU College of Engineering

CS-25-323 Modular Feedback Project Proposal

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Executive Summary

The Modular Feedback project aims to develop an innovative system for collecting feature-specific user feedback at Capital One. The project addresses the need for a more efficient and detailed method of gathering user opinions on various platform features, an area where traditional feedback mechanisms, such as surveys and forms, fall short due to low response rates and generalized feedback.

Given Capital One's diverse user base there is a significant challenge in collecting targeted feedback in a scalable manner. The proposed solution will introduce a modular web component, allowing users to provide quick sentiment-based feedback via a "thumbs up" or "thumbs down" mechanism. This feedback will be integrated with Clickstream analytics, enabling deeper insights into user behavior and feature engagement. The system will also include an admin dashboard to track feedback, monitor trends, and customize the implementation as needed.

The project's key objectives include improving Capital One's existing feedback mechanisms by creating a user-friendly interface for users to provide feedback, and building a robust database for tracking and storing that feedback. The system will be designed to be easily scalable, secure, and compliant with accessibility and security standards.

The project will be delivered in two iterations, with the first focusing on the implementation of the basic feedback module and Clickstream integration, while the second iteration will introduce advanced features such as text input for feedback and an administrative interface for data analysis. By providing a modular and adaptable system, this project will equip Capital One with the tools to continuously improve user experience, enhance engagement, and maintain a competitive edge in the market.

Table of Contents

Section A. Problem Statement	4
Section B. Engineering Design Requirements	6
B.1 Project Goals (i.e. Client Needs)	6
B.2 Design Objectives	6
B.3 Design Specifications and Constraints	7
B.4 Codes and Standards	8
Section C. Scope of Work	11
C.1 Deliverables	11
C.2 Milestones	12
C.3 Resources	12
References	14

Section A. Problem Statement

In today's ever evolving world of technology, it is important for platforms to be continuously adaptable to user needs and any problems that may arise with them. Businesses and organizations want to know consumers' opinions about their products and services [4] to make changes accordingly. A significant challenge faced by development teams is finding a way to gather feature-specific feedback from consumers to make changes and improvements where they are needed. As this scales to an enterprise like Capital One, a leading financial institution with over 100 million diverse users [1], it becomes increasingly difficult to gather feature-specific feedback in an efficient manner.

The problem at hand is the absence of a streamlined solution to be used in collecting and analyzing feedback on specific features. Currently, platforms may gather general user feedback through surveys and feedback forms. These methods often suffer from limitations such as low response rates, as mentioned in Human Relations, "low response rate in particular, is one of the... most frequently raised concerns regarding research design." The effect low response rate has on research design is also seen in feedback gathering tools. These methods lack mechanisms that focus specifically on the performance and reception of individual features, limiting an enterprises ability to understand what elements of a feature are working properly and which are needing improvement.

This problem has impacts on product managers, developers, UI teams, and others who rely on clear and actionable feedback to iterate new design features and functionality. It is mentioned in *Usability Engineering: Industry-Government Collaboration for System Effectiveness and Efficiency* that, "A significant cause of poor usability in the product stems from a lack of understanding of the development process." Without a structured feedback mechanism to help direct the development process, these teams may end up relying on data that does not accurately represent a problem, resulting in design decisions that might not be the best fit for a feature. Furthermore, the same article mentions that a participant's motivation to complete a survey may increase the validity of the feedback provided [3]. To ensure quality and actionable feedback, it is essential for us to create a feedback system that encourages users to participate.

A standardized feedback collection system would allow enterprises to track user behavior and gather feedback across multiple features or products. To account for this need, the collection system must be modular and able to be extensible to multiple platforms or products. Moreover, by capturing Clickstream data, data which tracks a user's path through a website, we can address user concerns more directly. This would improve customer satisfaction and enhance user engagement with the platform while also providing better feedback data to the teams who will make improvements with it.

The primary goal of this project is to create a robust and extensible system that will allow enterprises, such as Capital One, to efficiently gather feature-specific user feedback across multiple platforms. This solution will not only offer seamless integration across multiple

platforms but also provide Clickstream analytics to provide deeper insights to user behavior and feedback. By drawing conclusions from the Clickstream data in real-time we can help improve the user experience. Additionally, the system should provide an administration dashboard to assist in customizing and deploying the system. Ultimately, this solution will empower Capital One to make more informed decisions, continuously improve their systems, and maintain an edge over their competitors.

Section B. Engineering Design Requirements

This section defines the project's goals, objectives, and constraints to ensure the design meets Capital One's needs. It covers key aspects such as usability, integration, security, and performance. The requirements provide a framework for delivering a scalable, accessible feedback system aligned with industry standards and internal policies. These will guide development and be revisited as needed to stay on track with project goals.

B.1 Project Goals (i.e. Client Needs)

Here are the overall goals of the project. These points represent a generic overview of what our sponsor needs from us. These points will also help us stay on track for when we work on the project.

- Improve upon Capital One's current methods of handling agent feedback
- Provide a convenient and easy-to-use web service for Capital One agents to provide feature specific feedback
- Create a database to track and monitor feedback
- Ensure that feedback modules are easily implemented

B.2 Design Objectives

Here are the design objectives of our project. The objectives of our design are inspired by the SMART (Specific, Measurable, Achievable, Realistic, and Time-bound) acronym, used for setting organized goals for projects. Each objective is linked to a design specification in the design process.

- The design will allow Capital One agents to give feature specific feedback through a web component UI module. The agent will have the option of choosing a "thumbs up" or "thumbs down" option to capture basic sentiment. In later design iterations, the agent will be able to leave comments in a textbox upon choosing the "thumbs down" option.
- The design will record agent feedback in a database which will keep track of data like agent ID, whether "thumbs up" or "thumbs down" was selected, and the text feedback given.
- The design will be generalized to allow it to be implemented in a variety of areas.

- The design will be iterative to ensure that core components of the design are met before the implementation of additional, non-vital features. This will also allow us to have a previous design on hand in the case time does not allow us to complete the current iteration of the design.

B.3 Design Specifications and Constraints

This section outlines measurable requirements and boundaries that the design must adhere to, ensuring it aligns with project goals, usability expectations, and technical feasibility. Specifications are quantitative where possible, ensuring objective validation of success. Quantitative specifications are subjective and have potential to be adjusted in the future.

1. Integration Constraints

- Requirement: The system must integrate with Capital One's Empath system.
- Justification: Ensures compatibility with existing infrastructure and smooth deployment.
- Testable Metric: Successful API calls from the feedback system to the Empath platform.
- Language Constraints: The system backend must be built using a MySQL-compatible database.
- Testable Metric: Database must store feedback records without errors, with retrieval times under 100ms for queries involving 1,000+ records.

2. Generalization and Extensibility

- Requirement: Design must be generalizable for use in multiple environments.
- Testable Metric: Deploy the web component in at least two different Capital One systems.
- Extensibility Constraint: Future iterations should allow easy updates such as adding new feedback modules or expanding to mobile platforms.

3. UI and Usability Constraints

- UI Simplicity: Provide a thumbs up / thumbs down mechanism to keep the interface simple and increase response rates.
- Testable Metric: Achieve a minimum 10% increase in response rate compared to existing survey systems within 3 months.
- Accessibility: Ensure compliance with WCAG 2.1 accessibility standards.
- Testable Metric: Test the module with screen readers and keyboard navigation tools. 100% of core functionality must remain accessible.

4. Clickstream and Data Analytics Constraints

- Requirement: Include Clickstream tracking to understand user behavior and provide actionable insights.
 - Testable Metric: Collect at least 20 behavioral metrics (e.g., time spent per feature, navigation path) and visualize them in a dashboard.
 - Privacy Constraints: Must filter sensitive information in compliance with PCI standards.
 - Testable Metric: No PCI data (credit card details, personal info) should be present in Clickstream logs upon inspection.
5. Performance and Load Handling
- Requirement: The system must handle at least 10,000 concurrent users without performance degradation.
 - Testable Metric: Response times should remain below 1 second for all feedback submissions under peak load.
6. Security and Legal Constraints
- Compliance Requirements: Adhere to NIST security guidelines and Capital One internal policies for data protection.
 - Testable Metric: Conduct penetration testing, with zero critical vulnerabilities allowed before deployment.

B.4 Codes and Standards

This section identifies relevant industry standards, regulations, and codes that govern the design, development, and implementation of the project. Ensuring compliance with these standards guarantees quality, security, and interoperability of the feedback system within Capital One's infrastructure.

1. Data Security Standards

- NIST SP 800-53 – Security and Privacy Controls for Federal Information Systems
 Applicability: The system must follow guidelines for encryption, authentication, and data privacy, ensuring feedback data and Clickstream logs are protected during storage and transmission.
 Compliance Requirement: Use HTTPS encryption for all transmissions, with AES-256 encryption for stored data.
- PCI DSS 4.0 – Payment Card Industry Data Security Standard
 Applicability: Since user interactions may involve personal information that must not leak into Clickstream data, the system must filter and flag sensitive input.

Compliance Requirement: Validate that no PCI-relevant data (like payment card numbers) is retained in feedback logs.

2. Accessibility Standards

- WCAG 2.1 (Web Content Accessibility Guidelines)

Applicability: Ensures the web interface is accessible to all users, including those with disabilities.

Compliance Requirement: The UI must pass Level AA compliance, ensuring keyboard navigation support and compatibility with screen readers.

3. Usability and UI Standards

- W3C HTML5 and CSS3 Standards – Web Standards by the World Wide Web Consortium

Applicability: Ensure that the feedback modules follow recognized HTML and CSS standards for cross-browser compatibility and scalability.

Compliance Requirement: Test the system in multiple browsers (e.g., Chrome, Firefox, Safari) to ensure consistent performance.

- ISO 9241-11:2018 – Usability: Definitions and Concepts

Applicability: This standard guides the usability goals of the feedback system, focusing on user effectiveness, efficiency, and satisfaction.

Compliance Requirement: Achieve above 80% user satisfaction during initial usability testing.

4. Software Development Standards

- IEEE 830-1998 – Recommended Practice for Software Requirements Specifications

Applicability: Use this standard to create comprehensive and clear documentation for system requirements and iterations.

Compliance Requirement: All requirement documents must follow IEEE guidelines and be signed off by the sponsor and stakeholders.

5. Interoperability Standards

- IRTF RFC 2616 – HTTP/1.1 Protocol

Applicability: The system must handle HTTP requests and responses efficiently to exchange data between the frontend modules and backend services.

Compliance Requirement: Ensure 100% compliance with HTTP standards to avoid issues during API communication.

- ANSI SQL Standard – Database Query Language

Applicability: The feedback database uses MySQL, which follows the ANSI SQL standard.

Compliance Requirement: Queries must be optimized and adhere to ANSI SQL standards to ensure efficient data retrieval.

6. Capital One Internal Standards and Policies

- Capital One API Guidelines

Applicability: Since the system will integrate with Capital One's Empath system and cloud infrastructure, the design must adhere to internal API usage policies.

Compliance Requirement: Successful integration tests with zero policy violations.

Section C. Scope of Work

The Modular Feedback project for Capital One aims to create a robust and extensible system for gathering feature-specific user feedback across multiple platforms. This section outlines the project's boundaries, key objectives, timeline, milestones, and deliverables.

C.1 Deliverables

Here are the list of project deliverables for our sponsor and our college. Academic deliverables are the only requirements needed for the Fall semester. By the spring semester, two iterations of our project are required by our sponsor along with additional academic deliverables.

- Fall semester deliverables:
 - Team contract
 - Project proposal
 - Preliminary design report
 - Fall poster and presentation
- Spring semester deliverables:
 - Project iteration 1
 - Web component UI module (potentially to be created in Gravity) that can be used in a plug-and-play fashion
 - “Thumbs up” and “thumbs down” option.
 - Flexible Clickstream implementation
 - Basic dashboard to display results
 - Project iteration 2
 - Allow users to input their concerns into a textbox for the “thumbs down” scenario and determine a storage solution for these inputs.
 - PCI data filter implementation.
 - Create admin feedback UI to view feature specific verbatims and possible enhancements
 - Final design report
 - Capstone EXPO poster and presentation

C.2 Milestones

Milestone	Estimated Time	Completion Date
Requirements gathering and analysis	2 weeks	October 25, 2024
System architecture design	3 weeks	November 15, 2024
UI module development (Iteration 1)	4 weeks	December 13, 2024
Clickstream implementation	3 weeks	January 10, 2025
Basic dashboard development	2 weeks	January 24, 2025
Iteration 1 testing and refinement	2 weeks	February 7, 2025
Textbox and storage implementation (Iteration 2)	3 weeks	February 28, 2025
PCI data filter development	2 weeks	March 13, 2025
Admin feedback UI development	3 weeks	April 3, 2025
Iteration 2 testing and refinement	2 weeks	April 17, 2025
Final documentation and presentation preparation	3 weeks	May 8, 2025

C.3 Resources

The following resources will be needed for project completion:

1. Hardware:
 - Development laptops/workstations
 - Test servers for deployment
2. Software:
 - Integrated Development Environment (IDE) compatible with chosen programming languages
 - Version control system (e.g., Git)

- Database management system (e.g., MySQL)
- 3. Cloud Services:
 - Access to Capital One's cloud infrastructure for deployment and testing
- 4. APIs and Libraries:
 - Gravity framework (if used for UI module development)
 - Clickstream analytics libraries
 - Data visualization libraries for dashboard development
- 5. Data:
 - Sample datasets for testing feedback collection and analysis
 - PCI-compliant test data for filter development
- 6. Documentation:
 - Capital One's internal API documentation
 - Relevant coding standards and style guides
- 7. Access:
 - Necessary permissions to integrate with Capital One's Empath system

Our team will work closely with the project sponsor and faculty advisor to ensure all the required resources are available and that the project remains within scope throughout its duration.

References

Provide a numbered list of all references in order of appearance using APA citation format. The reference page should begin on a new page as shown here.

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