



Department of Computer Science

CPSC 490 / 491 CAPSTONE PROJECT PROPOSAL

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SMARTPOST

Abstract

SmartPost is a proposed web application designed to streamline social media management for businesses, influencers, and content creators. By integrating OAuth2 (Open Authorization 2.0, a secure protocol for account linking) for safe social media account connections and employing REST APIs (Representational State Transfer Application Programming Interfaces, used for communication between systems), the application allows users to create and distribute a single image post across multiple platforms. It consolidates comments from multiple sources into a unified dashboard, using AI for sentiment analysis and predicting audience reactions to draft posts based on similar past content. Key deliverables include a user-friendly interface and analytics for audience engagement. Functionality includes post-scheduling with real-time comment updates. The project addresses challenges in maintaining a consistent online presence while minimizing time investment, offering a scalable solution tailored for efficiency and privacy.

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1. Introduction

Many small businesses need help to rise online because they have a hassle managing multiple social media accounts. SmartPost is a web application that will simultaneously post to various social media platforms, requiring you to make only one post and view comments from all your posts using SmartPost. We use AI for sentiment analysis and to predict reactions to draft posts based on similar past content.

1.1. Background and Context

The business market thrives on the attention of Social Media. According to a Forbes article, “Top Social Media Statistics And Trends Of 2024”, about 77% of businesses use social media to reach out to new customers and expand their business and profits. Managing multiple accounts and tracking feedback across different platforms takes too much time.

1.2. Objectives and Significance

SmartPost will decrease the time spent posting between multiple platforms by having the same ability in one place. SmartPost will enable businesses to analyze engagement trends and optimize content, making tracking viewer feedback across social platforms easier.

1.3. Motivation for Proposal Choice

The primary motivation for SmartPost comes from a teammate’s family business struggling with time-consuming and inefficient social media management. Existing tools are costly and unreliable, making the challenge even harder. This inspired us to develop a streamlined, affordable solution to simplify social media management.

1.4. Capstone Summary

Computer Science Topics:

1. Web Development (CPSC 349): Utilizing modern frameworks like React for a responsive and interactive front.
2. API Integration (CPSC 449): Employing OAuth2 for secure account linking and REST APIs for platform communication.
3. Artificial Intelligence (CPSC 481/483): Implementing AI-powered sentiment analysis and automatic caption generation.
4. Database Management (CPSC 332): Designing efficient data storage and retrieval for user posts and analytics.
5. Cybersecurity (CPSC 253): Ensuring user data confidentiality, integrity, and availability via secure protocols and encryption.

Project Magnitude:

SmartPost exceeds the complexity of a typical upper-division project by requiring the integration of multiple technologies, such as real-time API interactions, sentiment analysis models, and a unified comment dashboard. The implementation spans several sprints, each addressing significant features, such as multi-platform posting, comment aggregation, analytics, and dynamic captioning.

Unmet Need:

While some tools offer limited social media management, they are often expensive, feature-restricted, or need more reliability. SmartPost provides a scalable, user-friendly, and affordable alternative, filling a gap for small businesses and content creators who need efficient social media tools without prohibitive costs. Extensive research into existing solutions ensures the project meets unique user needs that still need to be addressed by current products.

This project highlights the team's technical expertise and presents a viable, impactful solution for real-world problems, demonstrating the value of their computer science education.

2. Product Scope and Charter

2.1. Description of the Product

It is a single place for businesses and individuals to post and read comments from all their social media accounts. The product enables users to synchronize and share their online presence seamlessly across all connected social media platforms.

2.2. Features and Functional Requirements

2.2.1. Core Product

The product will be a web application that multiple users can use to make a single post and distribute to other social media platforms. It will communicate with platforms using OAuth2 for secure social media account linking and collect and display comments from all linked social platforms. It will use AI to generate sentiment analysis and predict audience reactions to a draft post based on similar past posts.

1. As a user, I want to securely link my social media accounts to the web application using OAuth2 to publish content without compromising my account security or personal data.
2. I want to see all comments from my linked social media platforms in one place to quickly review and respond to interactions without switching between platforms.
3. I want an easy-to-use interface to input my post details, like images, text, hashtags, and tags, so I can quickly and efficiently create posts with all the necessary elements.
4. As a user, I want to schedule my posts for future distribution across linked accounts to plan my content strategy and maintain a consistent posting schedule.

5. As a user, I want to view and manage my linked social media accounts in the application settings to easily control my account connections and permissions.
6. As a user using Sentiment Analysis, I want to view analytics for my posts across all linked platforms in a dashboard so I can analyze engagement and understand how my audience responds to my content.
7. As a user, I want to respond to comments from all platforms directly within the app to manage interactions and engage with my audience efficiently.
8. As a user, I want to securely log into the web application to ensure that only I can access my linked accounts and post history.
9. As a user, I want the application to guide me on platform-specific requirements so that I avoid errors when posting across multiple platforms.
10. As a user, I want to see how my audience is reacting to the post so that I can cater to my future posts using previous posts.
11. As a user, I want new comments to appear at the top of my comment feed so I can see the latest interactions first.
12. As a moderator, I want to review user content, including posts, comments, and media, to ensure adherence to content guidelines and maintain a safe and respectful platform.

2.2.2. Stretch Goals / Phase 2

Hashtag Suggestions for Boosting Post Visibility

1. As a user, I want the application to analyze my post content and suggest relevant hashtags so that I can increase the visibility of my posts.
2. As a user, I want hashtag suggestions tailored to my target audience to reach the right people with my posts.
3. As a user, I want to see metrics for how each suggested hashtag impacts my post visibility to make informed choices for future posts.

Responsive Design for Different Screen Sizes

1. As a user, I want the website to display content clearly on my mobile device so that I can access all features without issues.
2. As a user, I want the website to display content seamlessly on my tablet so that I can enjoy a consistent experience across devices.
3. As a developer, I want to test the application on multiple screen sizes to identify and fix layout issues for various devices.

Subscription System Model

1. As a user, I want to choose between different subscription plans to select the level of service that best suits my needs.
2. As a user, I want to securely pay for my selected subscription plan to protect my personal information.
3. As a subscribed user, I want access to premium features based on my subscription level to receive the benefits promised in my plan.
4. As a user, I want to manage my subscription, including renewal and cancellation, so that I have control over my payments.

Timed Comment Updates

1. As a user, I want new comments to load automatically at regular intervals so that I can stay updated on interactions.
2. As a user, I want to receive a notification when new comments are available so I am aware of recent interactions even if I'm not actively viewing the feed.

2.3. Non-functional Requirements

The website must load in under 2.5 seconds. User data must be securely protected, complying with industry standards for privacy and cybersecurity. New comments should be updated in user-selected time to maintain engagement and responsiveness. Detailed

documentation and open communication will address user's concerns about data handling and the implementation process.

2.4. Target and Operational Environment

The product will run on a website hosted on the cloud platform Microsoft Azure for scalability and reliability. It relies on a web server for user interactions and an API server for back-end processing and third-party integrations.

2.5. Project Deliverables

The deliverables will include:

- The website's custom domain (URL to be finalized).
- The complete code is hosted in a GitHub repository.
- A detailed README file in the GitHub repository provides instructions on how to run the website.

The product will be delivered in four stages: Delivery 1, 2, 3, and 4, each focusing on a list of features to implement from the Product Backlog and the User Feedback.

2.6. Project Assumptions and Limitations

The product will work on desktops and tablets. The AI model, trained on internet-wide data, may include sensitive context for phrases. API access for posting and fetching images is assumed, requiring users to connect accounts on at least two social media platforms.

2.7. Ethical Considerations

SmartPost helps users post content that reaches across all connected social media platforms. However, a breach of a SmartPost account could compromise all of the user's connected social media accounts.

3. Related Works and Concerns

3.1. Literature Review

Articles such as Forbes's "Top Social Media Statistics And Trends Of 2024" provided statistics about how people are active on social media and what kind of content attracts them. Understanding the latest trends is essential for individuals and businesses who are looking to maximize their presence on social media. Using these statistics helps us dive deep into the reason why there is a need for streamlined account management across multiple platforms.

3.2. Related Products and Systems

None

3.3. Security Concerns and Approaches

For security, the CIA triad ensures security with SSL for confidentiality, access controls, data validation for integrity, and backup servers for availability. OAuth secures social media connections for safe platform management.

3.4. Relevant Standards

OAuth2 (Open Authorization 2.0)

- Enables secure account linking and authentication for users connecting their social media accounts.
- Ensures user data privacy and prevents unauthorized access to social media accounts.

REST API Standards

- Facilitates seamless communication between the web application and social media platforms.

- Allows integration with platforms like Facebook, Instagram, and LinkedIn to support cross-platform posting and comment aggregation.

CIA Triad (Confidentiality, Integrity, Availability)

- Ensures secure handling of user data by focusing on encryption (e.g., SSL), data integrity, and system uptime.
- Protects user information and ensures the reliability of the application.

Responsive Web Design Standards

- Adapts the application to work on different devices (desktop, tablet).
- Enhances usability and accessibility for users on various platforms.

AI Standards for Sentiment Analysis

- Ensures ethical and transparent use of AI for analyzing audience sentiment and generating captions.
- Prevents biased or inappropriate outputs and improves user trust.

4. Stakeholders, Users, and Benefits

4.1. Stakeholder Identification

Primary Stakeholder: As the project owner responsible for the app's design, functionality, and development, the key priorities are:

- Ensuring security, data privacy, and account integrity to protect against unauthorized access and data breaches.
- Developing a user-friendly interface for seamless connection and management of social media accounts.
- Enabling functionality for cross-platform posting and syncing comments efficiently.

Secondary Stakeholders: Business owners, influencers, and content creators rely on the app for:

- Efficient and time-saving post management.
- Audience analytics to observe engagement.
- Secure handling of their account information.

4.2. User Identification

The target audiences for this project are social media managers, content creators, and influencers who are actively on social media and want to promote their products.

4.3. User Roles – their needs and the benefits gained

The user's role is to make posts, view comments, and observe analytics and sentiment.

A log user role that is only able to view the account's logs of prior posts made on SmartPost.

4.4. Internal User Roles

The moderator reviews the user's content guidelines by editing or removing inappropriate posts, comments, and media. They also handle report action if someone violates the policy.

5. Technical Architecture & High-Level Design

5.1. System Architecture

The system architecture has several key components. For the front end, we will be implementing using React. The AI data will be retrieved using the Rest API. The Backend will be developed using Django and Flask. The External APIs supported will include Meta for Instagram and Post API for Facebook.

5.2. High-Level Design

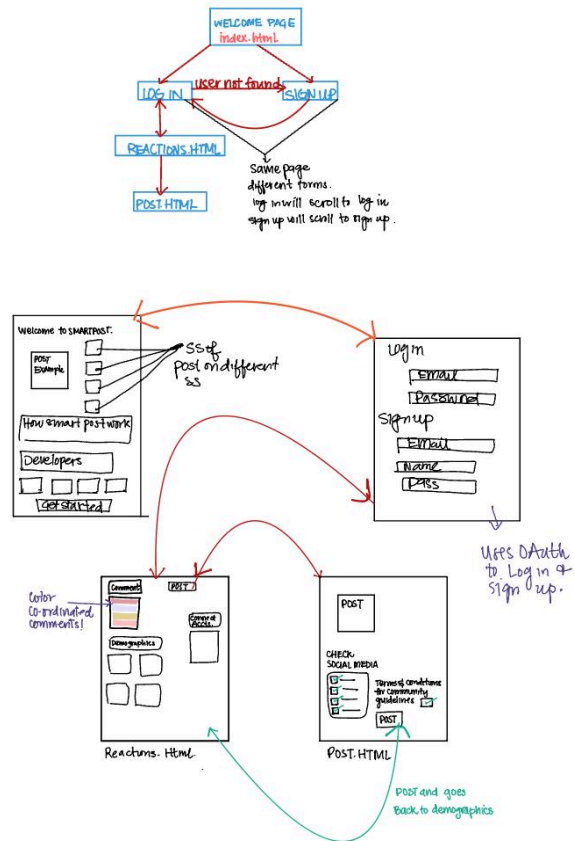


Figure 5.2.1 UI/UX Flow

5.3. Data Stores

The major data entities will be posts and comments.

5.4. Frameworks, APIs, Components, Services, and Tools Used

- Meta Post
- Instagram API

- LinkedIn API
- React
- Django

6. Project Management

6.1. Team

Khushi Kaushik	Project manager and Full stack developer
Ngoc Nguyen	Full stack developer
Trang Ngo	Full stack developer
Alyssa Amancio	Full stack developer

6.2. Methodology

The project will follow the **Agile** methodology.

6.3. Project Timeline

Python Setup	High-A	Set up Python environment and libraries
OAuth Integration	High-A	Implement OAuth for secure social media account linking (Facebook, Twitter, etc.).
Comment Aggregation	High-A	Collect and display comments from all linked social platforms.
Backend Integration	Medium-B	Connect the API to the Frontend/Backend
Frontend Development	Medium-B	Build a user interface for entering post data.
AI Caption Generator	Medium-B	Implement AI to generate captions based on sentiment analysis.
Data Preprocessing	Medium-B	Clean and process data for model training.

User Authentication System	Low-C	Implement a user authentication system for secure access to the website.
User Feedback Loop	Low-C	Create a system where user feedback can be collected to improve predictions and features.
Subscription System	Low-C	Develop a paid subscription model.
Hashtag suggestions	Low-C	Smart hashtag suggestions to boost post visibility based on target audience insight

Table 6.3.1 Project Timeline

This project timeline for SmartPost is structured around prioritized tasks categorized by their importance (High, Medium, Low). By focusing on high-priority tasks such as Python setup, OAuth integration, and comment aggregation early on, we ensure that foundational features are implemented first. The Agile methodology is evident in our approach, allowing flexibility to refine and adapt features like AI sentiment analysis and feedback loops as progress is made and user needs evolve.

6.4. Subprojects

Backend:

- Database: store user information, social media account credentials, and post data.
- Web Server: to handle requests, interact with the API, and serve both the front-end and back-end functionalities.

Frontend:

- Information Screen that describes the website and its features
- User Post page to create new posts and designate where it will be displayed on which social media platforms
- User dashboard for comments and analytics
- User login and signup

Social Media Integration:

- Social Media Integration would require Post and GET APIs of the social media
- We can implement user authentication, social media platform integration, scheduling posts, and producing sentiment analysis visualizations through APIs.

6.5. Risks and Feasibility

- Potential conflicts with other class commitments.
- Communication breakdowns within the team could lead to delays or misalignment.
- Scope changes or unexpected obstacles may arise, affecting project timelines.
- Not able to access APIs.

6.6. Release Plan

Step 1: Final Completion

By April, have the website completed so that advisors can make critiques.

Step 2: Website Open to Public

The website will be fully operational by May and ready for public use.

7. Evaluation and Assessment

7.1. Success Criteria

The success criteria for SmartPost will be successfully hosting it for people to use. Our initial success will include helping TaxMan CPAs get an online presence. Then, we will start a brand from scratch to see how SmartPost can positively impact users' platform presence. With SmartPost, we can realistically test the features, including user engagement metrics and comment synchronization. Additionally, we aim to gather user feedback to enhance the user experience and further develop more features.

7.2. Testing Plan

The testing plan will initially be conducted using the Feedback Google Form. Moving forward, we will include personal feedback and a quick 5-minute Zoom meeting, with an incentive to a raffle for detailed feedback and areas of improvement.

7.3. User Evaluation

The Users can respond to the Feedback Evaluation on these criteria:

- Usability and Design/Interface
- Bugs and Responsiveness
- User Satisfaction and Functionality

Feedback will be handled with a ticketing system. We will open tickets on GitHub to track usability, bugs, and functionality issues. Tickets will include details about the problem and the priority level. The ticket will be assigned to a team member who will follow up, fix the issue, and close the ticket on GitHub.

7.4. Measurement of Benefits

The volume and the category of the tickets will help us track the number of issues/bugs solved to increase user satisfaction. The decrease in the number of tickets and issues will indicate that users are experiencing fewer issues. If we monitor the number of tickets requesting new features, we can successfully develop ideas for implementing and introducing them. Based on the number of users who sign up to SmartPost, we will be able to gauge how many people have found the product to be helpful.

8. Glossary

Term	Definition
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AI	(Artificial Intelligence) The simulation of human intelligence in machines that are programmed to think, learn, and problem-solve autonomously.
Analytics	Data and metrics that provide insights into user engagement, audience behavior, and content performance.
Caption Generator	An AI-powered tool that creates captions for posts based on content and sentiment analysis.
CIA Triad	A security model focusing on Confidentiality, Integrity, and Availability to safeguard data and systems.
Dashboard	A user interface that presents aggregated data and tools for managing posts and viewing analytics.
Graph API	A tool provided by platforms like Facebook to allow developers to interact programmatically with their data.
Hashtag	A word or phrase preceded by the "#" symbol is used to categorize content and make it easily searchable on social media.
OAuth2	Open Authorization 2.0 protocol enables secure linking and authentication of third-party accounts.
OAuth Tokens	Digital credentials are used to securely authorize users without sharing passwords.

Responsive Design	A design approach ensuring the application works seamlessly across different devices and screen sizes.
REST API	Representational State Transfer Application Programming Interface is a set of rules that allows systems to communicate over HTTP.
Sentiment Analysis	The use of AI to evaluate the tone and emotion conveyed in text, such as social media comments.
SSL	Secure Sockets Layer is a standard security protocol for encrypting communications between web servers and browsers.
Subscription Plans	Different tiers of paid services offer varying levels of features and functionality.
User Authentication	Verifying a user's identity to grant access to a system or service.

Table 3 Glossary

9. Appendix

9.1. Appendix 1: Product Summary

 *Submission Product Summary SmartPost*

9.2. Appendix 2: ECS Expo Abstract

9.2.1. Project Background

SmartPost is a centralized social media management tool designed to help businesses and content creators streamline their workflows. By using OAuth2 for secure account linking and REST APIs for seamless platform integration, users can create, schedule, and analyze posts across multiple platforms from a single interface. The platform consolidates audience feedback with AI-powered sentiment analysis and predicts reactions to draft posts based on similar past content.

9.2.2. Problem Statement

SmartPost simplifies social media management by centralizing posting and analytics. It addresses inefficiencies and fragmented interactions faced by businesses and content creators when managing multiple platforms, offering AI-driven insights to improve engagement.

9.2.3. Goals and Objectives

Managing multiple social media accounts takes time and effort, leading to fragmented interactions and missed opportunities for audience engagement.

9.2.4. Design Requirement/Specifications

- OAuth2 for secure account linking.
- REST APIs for multi-platform integration.
- AI for generating captions and analyzing audience sentiment.
- Unified dashboard for comments and analytics.
- Support for post-scheduling and future scalability to include hashtag suggestions.

9.2.5. Methodology

The project will follow Agile methodology with five key sprints:

1. Develop the front end for account linking.
2. Implement cross-platform posting functionality.
3. Integrate a unified dashboard for comments.
4. Add sentiment analysis tools.
5. Enable AI-driven caption generation tailored to user preferences.

9.2.6. Results or Outcomes

Expected outcomes will include a functional, user-friendly web application capable of improving social media workflow efficiency. Users will benefit from secure account management, streamlined posting, and actionable engagement insights.

9.3. Draft ECS Poster

