**Problem-Solving Approach, Methodology, RACI, and Roadmap**

**Problem-Solving Approach**

**Objective:**  
Analyze customer sentiment about Costco’s products and services on social media platforms and provide actionable insights through a web application and summarization chatbot.

1. **Problem Definition:**
   * **Challenge:** Lack of consolidated insights into customer sentiment across public social media platforms.
   * **Goal:** Build a scalable and reusable data science solution for sentiment analysis and insight generation.
2. **Key Deliverables:**
   * Cleaned dataset of public social media data.
   * Sentiment analysis reports.
   * Recommendations for product/service opportunities.
   * Knowledge graph visualization and summarization chatbot prototype.

**Methodology**

**1. Data Collection and Preprocessing**

* **Sources:** Instagram, Reddit, Twitter (X), Facebook, Costco.com reviews.
* **Tools:** BeautifulSoup, Selenium, Scrapy, public APIs, Apify, or Unwrangle.
* **Steps:**
  1. Scrape data using web scraping techniques and APIs.
  2. Clean and preprocess the data (remove duplicates, irrelevant data, and noise).
  3. Segment data by product/service mentions, geography, and other relevant attributes.

**2. Sentiment Analysis**

* **Tools:** VADER, TextBlob, Hugging Face Transformers (BERT).
* **Steps:**
  1. Tokenize and preprocess text data (NLP preprocessing).
  2. Perform sentiment analysis (positive, negative, neutral).
  3. Aggregate results by product and geography for trend identification.

**3. Visualization and Reporting**

* **Tools:** Matplotlib, Seaborn, Plotly, Tableau, or Power BI.
* **Steps:**
  1. Build a knowledge graph for products and their sentiment trends.
  2. Develop propensity scoring for product families.
  3. Create dashboards to display insights interactively.

**4. Chatbot Development**

* **Tools:** Rasa, Dialogflow, or OpenAI APIs.
* **Steps:**
  1. Integrate AI summarization techniques (extractive/abstractive).
  2. Enable interactive reporting through chatbot interfaces.
  3. Test chatbot functionality and refine for usability.

**Roadmap**

**Phase 1: Planning and Research (2 Weeks)**

* Define scope and objectives.
* Identify data sources and tools.
* Develop a project timeline and assign roles.

**Phase 2: Data Collection and Preprocessing (4 Weeks)**

* Scrape data from identified sources.
* Preprocess and segment data.
* Validate data quality and completeness.

**Phase 3: Sentiment Analysis (4 Weeks)**

* Develop and train sentiment analysis models.
* Test and validate model accuracy.
* Aggregate sentiment results for trend analysis.

**Phase 4: Visualization and Reporting (3 Weeks)**

* Build knowledge graph and dashboards.
* Integrate propensity scoring and trend analysis.
* Validate visualization tools with stakeholders.

**Phase 5: Chatbot Development (3 Weeks)**

* Develop summarization chatbot prototype.
* Test chatbot functionality and usability.
* Integrate chatbot with reporting tools.

**Phase 6: Testing, Deployment, and Documentation (2 Weeks)**

* Conduct end-to-end testing.
* Deploy solutions in a live environment.
* Provide documentation and training for stakeholders.

**Phase 7: Stretch Goals (Optional, 4 Weeks)**

* Develop a real-time sentiment monitoring dashboard.
* Perform advanced topic modeling.
* Enhance chatbot integration with live social media streams.