Technical Documentation – Research Assistant Agentic System (CrewAI)

1. System Overview

The Research Assistant Agentic System is a multi-agent workflow built using CrewAI Studio. It automates the research process by identifying credible sources, extracting key insights, and generating a structured research report. The system contains three specialized agents, multiple built-in tools, one custom tool, and sequential orchestration to ensure smooth information flow and reliable output.

2. Architecture Diagram (Text Version)

User Input → Controller → Research Specialist → Web Search → Source List → Content Analyst → Web Scraping → Extracted Findings → Research Report Writer → Custom Markdown Tool → Final Report

Data flows sequentially from one agent to the next, and each output becomes the input for the next processing stage.

3. Agent Roles and Responsibilities

Research Specialist

- Finds 3–5 credible online sources.
- Uses Serper Web Search Tool.
- Filters unreliable websites.
- Produces a structured list (title, URL, summary).

Content Analyst

- Scrapes webpage text using ScrapeWebsiteTool.
- Extracts key points, evidence, and insights.
- Summarizes findings into structured notes.

Research Report Writer

- Uses Custom Markdown Report Generator Tool.
- Converts extracted insights into a complete research paper.
- Ensures all required sections are present and well-organized.

4. Tool Integration

Built-In Tools Used

1. SerperDevTool – performs online search.
2. ScrapeWebsiteTool – extracts webpage content.
3. LLM reasoning – provides summarization and analysis.

Custom Tool

Markdown Report Generator

- Input: Research topic + extracted findings.
- Output: Full academic-style Markdown report.
- Includes: Executive Summary, Introduction, Key Findings, Discussion, Conclusion, References.
- Validates structure and handles missing data gracefully.

5. Workflow Orchestration

- Workflow runs sequentially: Search → Analyze → Report.
- Each agent receives structured data from the previous step.
- Controller manages transitions and error recovery.
- If sources fail to load, fallback LLM logic generates a basic report.
- Memory is preserved across agents through structured JSON outputs.

6. Prompt and Code Documentation (Summary)

Research Specialist Prompt: Retrieve 3–5 credible sources and summarize them.
Content Analyst Prompt: Scrape each source and extract the main insights.
Report Writer Prompt: Convert insights into a full Markdown-formatted research report.

7. Setup and Usage Instructions

Setup

1. Open CrewAI Studio.
2. Create a new workflow.
3. Add three agents with the roles listed above.
4. Attach SerperDevTool to Research Specialist and ScrapeWebsiteTool to Content Analyst.
5. Add the custom Markdown Report Tool to Research Report Writer.
6. Connect tasks in sequential order.
7. Save the project.

Usage

1. Navigate to the Execution tab.
2. Enter a value for “research_topic.”
3. Run the workflow.
4. View and copy the final generated report from the output section.

8. Performance and Limitations

Strengths

- Fully automated multi-agent pipeline.
- Accurate extraction and clean Markdown output.
- Strong error handling and fallback behavior.

Limitations

- Cannot scrape paywalled websites.
- Webpage structure may affect extraction quality.
- Execution time depends on external API latency.

9. Conclusion

This Technical Documentation provides a complete overview of the architecture, agent roles, tools, workflow design, setup process, and system behavior. The system fulfills all requirements of the Building Agentic Systems Assignment including multi-agent orchestration, built-in tool usage, custom tool integration, error handling, memory management, and structured output generation.