Reflection Report: Multi-Agent Sales & Inventory System Evaluation

1. System Overview and Architecture

The implemented system follows a multi-agent architecture designed to simulate the operations of a paper supply company. The workflow consists of the following primary agents:

- Request Processing Agent: Receives quote requests and parses items, quantities, and dates.
- Inventory Management Agent: Checks stock availability and flags insufficient inventory.
- Financial Agent: Updates cash balance based on sales and purchase costs.
- Decision & Response Agent: Generates customer-facing responses explaining fulfillment decisions.

Overall workflow:
1. Request received
2. Inventory checked
3. Financial feasibility verified
4. Decision made
5. Cash and inventory updated
6. Response recorded in test_results.csv.

2. Evaluation of System Using test_results.csv

The system was evaluated using the full dataset provided in quote_requests_sample.csv. Results were recorded in test_results.csv.

Requirement 1: At least three requests resulted in a cash balance change. This was satisfied (e.g., cash increased from 45059.70 to 45860.12).

Requirement 2: At least three quote requests were successfully fulfilled. Several orders were processed successfully.

Requirement 3: Not all requests were fulfilled, with clear reasons provided (insufficient stock, unavailable items, insufficient cash).

3. Strengths of the Implemented System

- Accurate financial tracking with consistent balance updates.
- Realistic enforcement of inventory constraints.
- Clear decision transparency through informative responses.
- Modular design improving maintainability.

4. Limitations Observed

• Static reordering strategy without demand-based optimization.
• Limited partial fulfillment logic.
• No predictive demand forecasting.

5. Suggestions for Improvement

Improvement 1: Implement intelligent reorder thresholds.
Improvement 2: Add product substitution logic for unavailable requests.
Improvement 3: Incorporate predictive analytics for demand forecasting.

6. Conclusion

The multi-agent system successfully fulfills the project requirements, demonstrating correct financial tracking, inventory enforcement, and meaningful response generation. The modular architecture is robust and aligned with business constraints. Future improvements could enhance intelligence and efficiency.

Diagram Explanation: Multi-Agent Workflow

The workflow diagram illustrates the architecture of the multi-agent system implemented for The Beaver's Choice Paper Company.
The system is designed to process customer quote and order requests through specialized agents, each responsible for a distinct business function.
This modular approach improves clarity, maintainability, and decision accuracy.

1. Customer Request Entry Point
The process begins when a Customer or Sales Representative submits a request. Requests may include inventory availability questions, quote requests,
direct purchase or reorder requests, and delivery timeline inquiries.

2. Orchestrator Agent (Central Coordinator)
The Orchestrator Agent functions as the system's controller. Its responsibilities include parsing user intent, extracting key request fields
(product, quantity, customer, deadline), routing tasks to specialized agents, and combining outputs into a final response.

3. Inventory Agent
The Inventory Agent handles stock-related checks such as availability and reorder requirements. It interacts with database tools:
- get_all_inventory()
- get_stock_level()

4. Pricing & Quote Agent
The Pricing & Quote Agent generates customer quotes and pricing assumptions. It checks historical quote data using:
- search_quote_history()

5. Order Fulfillment Agent
Once an order is approved, the Order Fulfillment Agent executes transactions by confirming order placement, updating inventory,
and recording transactions using:
- create_transaction()

6. Finance Tool Integration
The Finance Tool monitors company cash flow and ensures financial feasibility before reorders or fulfillment. Key functions include:
- get_cash_balance()
- generate_financial_report()

7. Supplier & Delivery Agent
The Supplier & Delivery Agent manages delivery feasibility and restocking timelines. It estimates delivery dates using:
- get_supplier_delivery_date()

8. Final Response Generation
After all agents complete their tasks, the orchestrator compiles results into a final customer-facing response, such as quote confirmation,
order success notification, rejection due to insufficient stock, or delivery ETA updates.

Summary of Benefits
This multi-agent architecture provides clear separation of responsibilities, accurate enforcement of inventory and cash constraints,
transparent customer communication, and modular design supporting future improvements.