Yangalytics AI Agent #1 – Case Study

Supply & Capacity Exception Triage Agent

1. Executive Summary

This case study documents the design and prototyping of a governed, agentic AI workflow for weekly supply and capacity exception triage. The agent ingests messy, semi-structured operational data and produces a prioritized, decision-ready view—improving decision velocity while protecting leadership attention.

2. Problem Context

As organizations scale operations, exception volume across supply, inventory, and capacity increases sharply. Without structured triage, leadership attention is consumed by reactive escalation while true constraints are surfaced late. Planning systems frequently lag floor reality, forcing teams into firefighting.

3. Goal & Non-Goals

Goal: Improve weekly operational decision-making by identifying, prioritizing, and routing supply and capacity exceptions so leaders focus on the right issues first.

Non-Goals: This agent does not optimize schedules, replace planners, implement ERP/APS systems, or automate negotiations or approvals.

4. Raw Inputs (Before Agent Processing)

The agent is intentionally designed to ingest imperfect, real-world operational data. Inputs include CSV-style exports with repeated items, inconsistent severity signals, and free-text planner notes. No manual data cleanup is performed prior to agent execution.

csv Copy

```
exception_id,item,supplier,site,due_date,q
EX-001,VALVE-SS-042,HydraFlow,NBP,2026-01-
EX-002,PCB-CTRL-118,NorthPeak Circuits,NBP
EX-003,BOLT-M8-30,FastenAll,NBP,2026-02-02
EX-004,HOUSING-AL-210,MetalWorks Inc,NBP,2
EX-005,SENSOR-TEMP-009,ThermoSense,NBP,202
EX-006,GASKET-EPDM-55,SealPro,NBP,2026-02-
EX-007,BRACKET-ST-77,IronForm,NBP,2026-01-
EX-008,PCB-POWER-332,NorthPeak Circuits,NB
EX-009,FASTENER-M6-20,FastenAll,NBP,2026-0
EX-010,MOTOR-DRV-88,ElectroMotion,NBP,2026
EX-011,ENCLOSURE-SS-310,MetalWorks Inc,NBP
EX-012,CONNECTOR-12P,LinkTech,NBP,2026-01-
EX-013,FILTER-HEPA-99,AirPure,NBP,2026-02-
EX-014,DISPLAY-LCD-5in,ViewOptics,NBP,2026
EX-015,CABLE-HARNESS-44,WiredRight,NBP,202
EX-016,VALVE-SS-042,HydraFlow,NBP,2026-02-
EX-017,ACTUATOR-LIN-200,MotionCore,NBP,202
EX-018,SEAL-RUB-10,SealPro,NBP,2026-02-14,
EX-019,SENSOR-PRESS-88,ThermoSense,NBP,202
EX-020,FRAME-AL-500,MetalWorks Inc,NBP,202
EX-021,PCB-CTRL-118,NorthPeak Circuits,NBP
EX-022,FAN-COOL-60,AirFlow Dynamics,NBP,20
EX-023,CLAMP-SS-12,FastenAll,NBP,2026-02-0
EX-024,MODULE-CTRL-X,ElectroMotion,NBP,202
EX-025,HOUSING-AL-210,MetalWorks Inc,NBP,2
```

Figure 1: Raw CSV-style exception data as ingested by the agent, containing mixed signal quality and unstructured notes.

5. Agent Design

The agent operates as a governed decision-support system following a fixed weekly loop:

Ingest → Interpret → Decide → Recommend → Escalate → Summarize.

It combines rule-based thresholds (lateness, severity, customer impact) with contextual reasoning derived from planner notes.

6. Agent Output (After Processing)

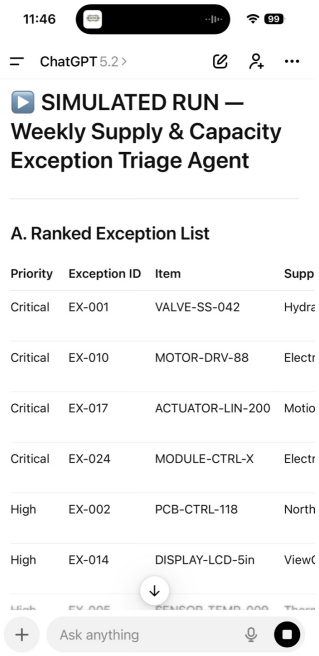

Figure 2: Example agent execution output showing normalized, ranked exceptions rendered in an executive-readable format.

Ranked Exceptions (Excerpt):

Priority	Exception ID	Item	Supplier	Issue Type	Decision Lens
Critical	EX-001	VALVE-SS-042	HydraFlow	Late PO	Escalate
Critical	EX-010	MOTOR-DRV-88	ElectroMotion	Late PO	Escalate

Critical	EX-017	ACTUATOR-LIN-200	MotionCore	Late PO	Escalate
High	EX-002	PCB-CTRL-118	NorthPeak Circuits	Lead Time Change	Decide

7. Executive Review (Weekly Summary)

Top Risks: Line-down exposure from motors, actuators, and valves; repeated PCB lead-time instability.

Decisions Required: Approve expedites or alternate sourcing for motors and actuators; select mitigation strategy for PCB supply risk.

Emerging Patterns: Supplier concentration risk in electronics and early visibility of capacity constraints.

8. Governance & Guardrails

The agent escalates decisions—not problems—to the lowest appropriate level of authority. Functional issues are routed for resolution, cross-functional tradeoffs are escalated jointly, and executive escalation is reserved for line-down risk, customer or revenue impact, or enterprise-level allocation decisions.

Appendix A — Agent Prompt & Execution Logic

System Prompt: You are a Supply & Capacity Exception Triage Agent. Your role is to ingest operational exception data, classify issue types, score priority using rule-based thresholds and contextual reasoning, recommend non-executing actions, route ownership, escalate when confidence is low or customer impact is present, and produce a concise weekly exceptions brief.

Execution Order: Ingest → Classify → Score → Recommend → Route → Escalate → Summarize.

All outputs must conform to a fixed structure and include audit explanations for any Critical or escalated items.

Appendix B — Agent Output Tables

B.1 Escalation List with Decision Levels

Exception ID	Escalation Level	Decision Required	Owner
EX-001	Level 3 – Executive	Approve expedite or resequence build	Leadership
EX-010	Level 3 – Executive	Approve alternate sourcing	Leadership
EX-017	Level 3 – Executive	Confirm recovery & customer comms	Leadership
EX-002	Level 2 – Cross-Functional	Define PCB mitigation strategy	Procurement + Planning
EX-005	Level 1 – Functional	Confirm quality recovery timing	Quality

Appendix C — Executive Weekly Review (Full)

This appendix contains the full executive synthesis produced by the agent following triage and escalation.

Top Risks:
- Line-down exposure from motors, actuators, and valves
- Repeated PCB lead-time instability from NorthPeak Circuits
- Emerging capacity ceiling at ElectroMotion

Decisions Required:
- Approve expedites or alternate sourcing for motors and actuators
- Decide PCB mitigation strategy (buffer vs dual source)
- Confirm allocation priorities for constrained modules

Emerging Patterns:
- Supplier concentration risk in electronics
- Capacity limits surfacing before formal planning signals
- Planner notes reliably predict escalation needs

Appendix D — Execution Instructions (Runnable Agent)

This appendix provides the minimal execution instructions required to run the agent end-to-end, without altering the core design or governance model.

Inputs

- A CSV file containing supply and capacity exceptions (`exceptions.csv`).
- Each row represents a potential decision item.
- Data may be incomplete, inconsistent, or ambiguous.

Execution Steps

1. Ingest all rows from the CSV without manual preprocessing.
2. Execute the agent loop in the following order:
   Ingest → Classify → Score → Recommend → Route → Escalate → Summarize.
3. Apply both rule-based thresholds and contextual reasoning when scoring priority.
4. Route escalations to the lowest appropriate level of decision authority.
5. Produce outputs using the fixed structure defined below.

Required Output Structure

The agent must produce all three outputs in a single run:

A. Ranked Exception List
- Priority (Critical / High / Medium / Low)
- Exception ID
- Item
- Supplier
- Issue Type
- Decision Lens (Escalate / Decide / Monitor)
- Confidence (High / Medium / Low)

B. Escalation List
- Exception ID
- Escalation Level (Functional / Cross-Functional / Executive)
- Decision Required
- Owner

C. Weekly Executive Brief
- Top Risks
- New vs. Recurring Issues
- Decisions Required This Week
- Emerging Patterns

Audit & Explainability Requirement

For any Critical or escalated item, the agent must include a brief explanation referencing:
- rule-based signals (e.g., lateness, severity, customer impact)
- contextual reasoning (e.g., language in notes, repeated suppliers or parts)

Execution Constraints

- Outputs are advisory only.
- No commitments, communications, or system updates may be generated.
- All inputs are read-only.