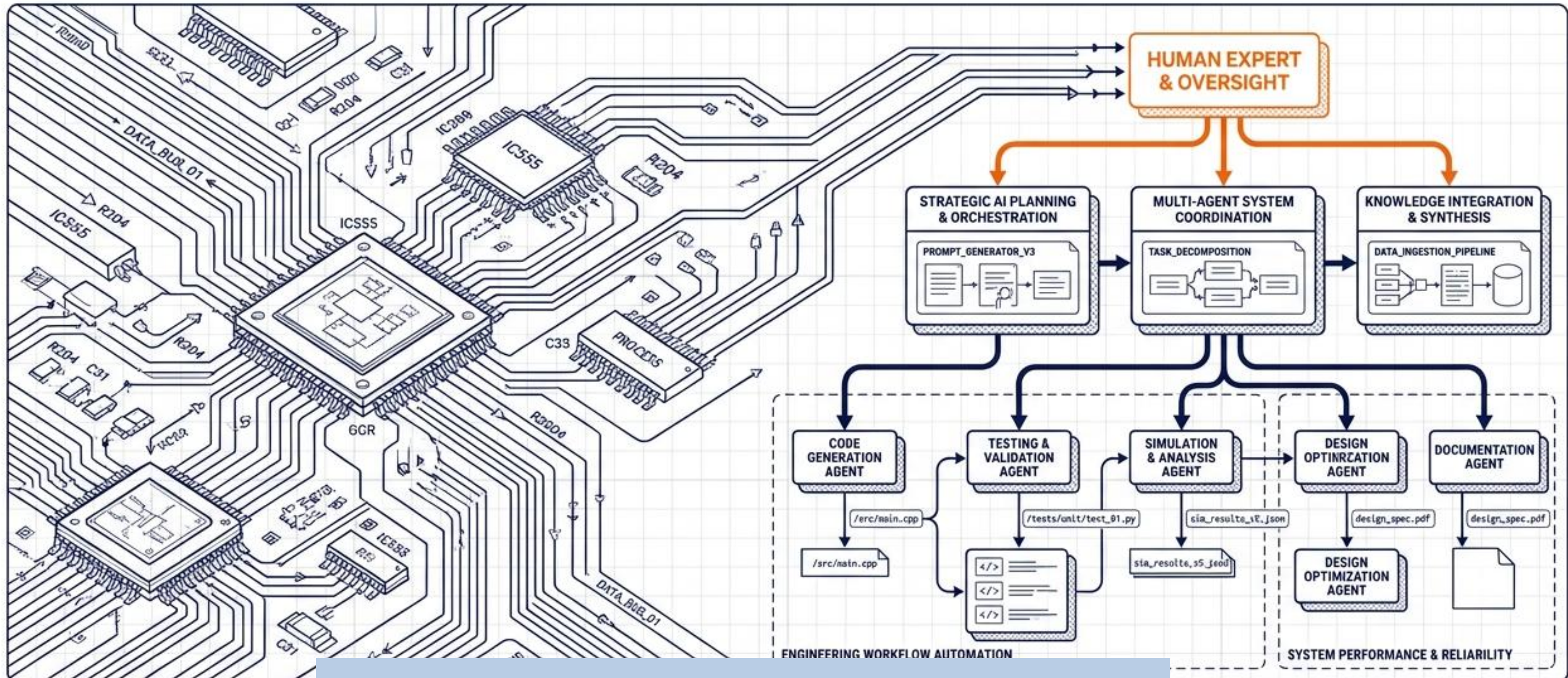


# AI as an Engineering Force Multiplier

System Architecture, Capabilities, and Workflows for Multi-Agent Engineering Environments



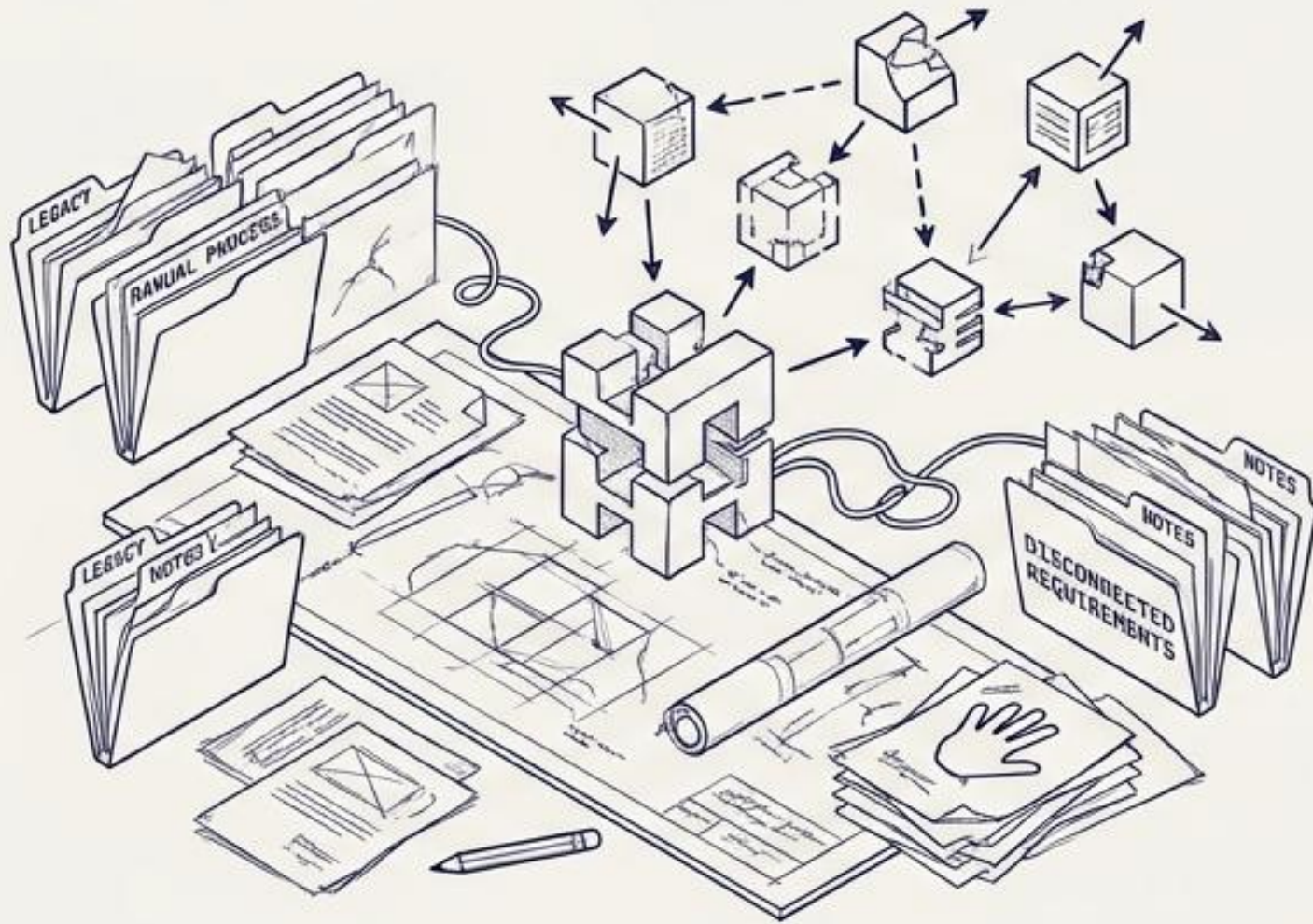
Noti Haim



Property of Haim Noti – System Engineering and Project Management

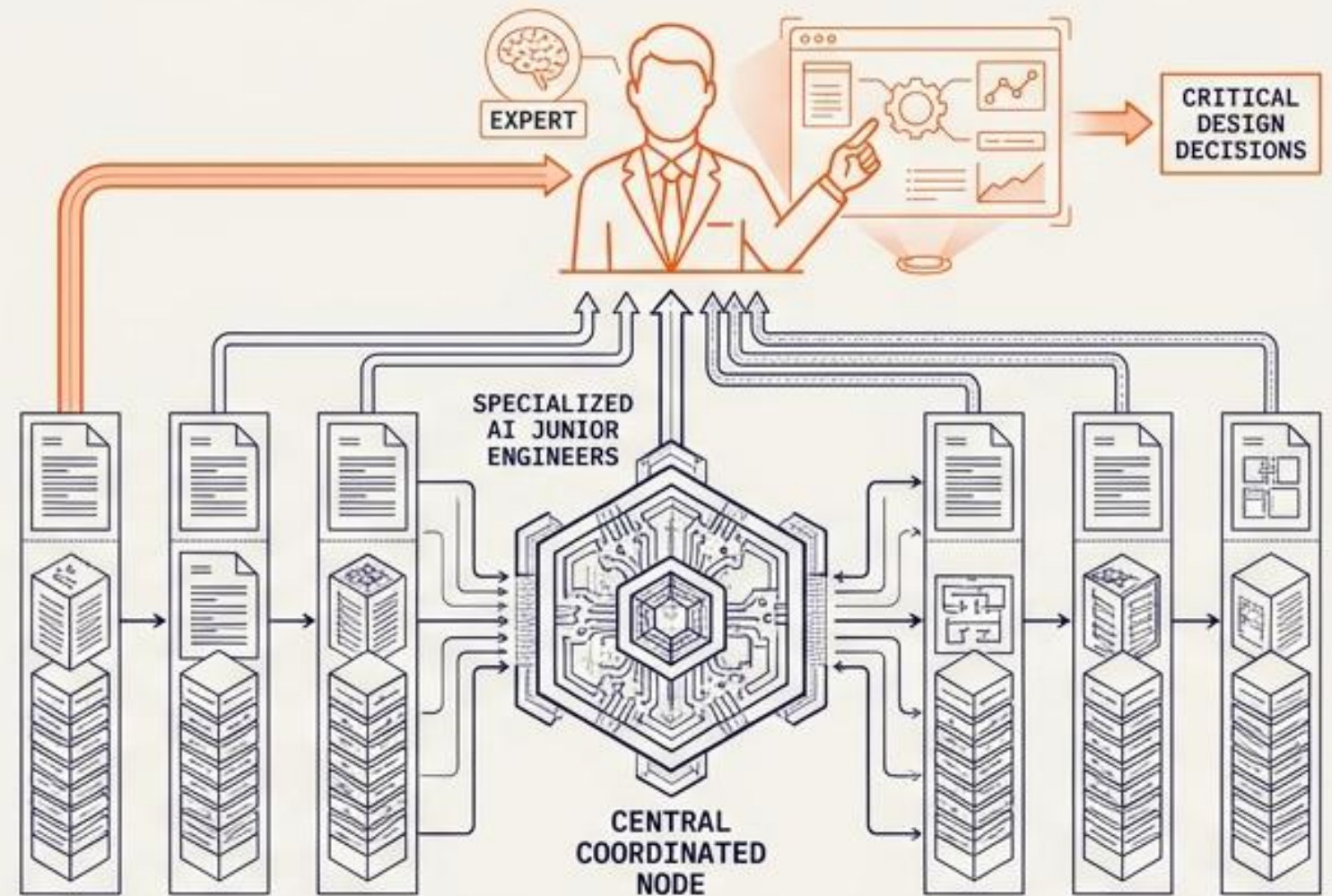
# Transitioning from Fragmented Data to Coordinated Intelligence

## The Current Challenge



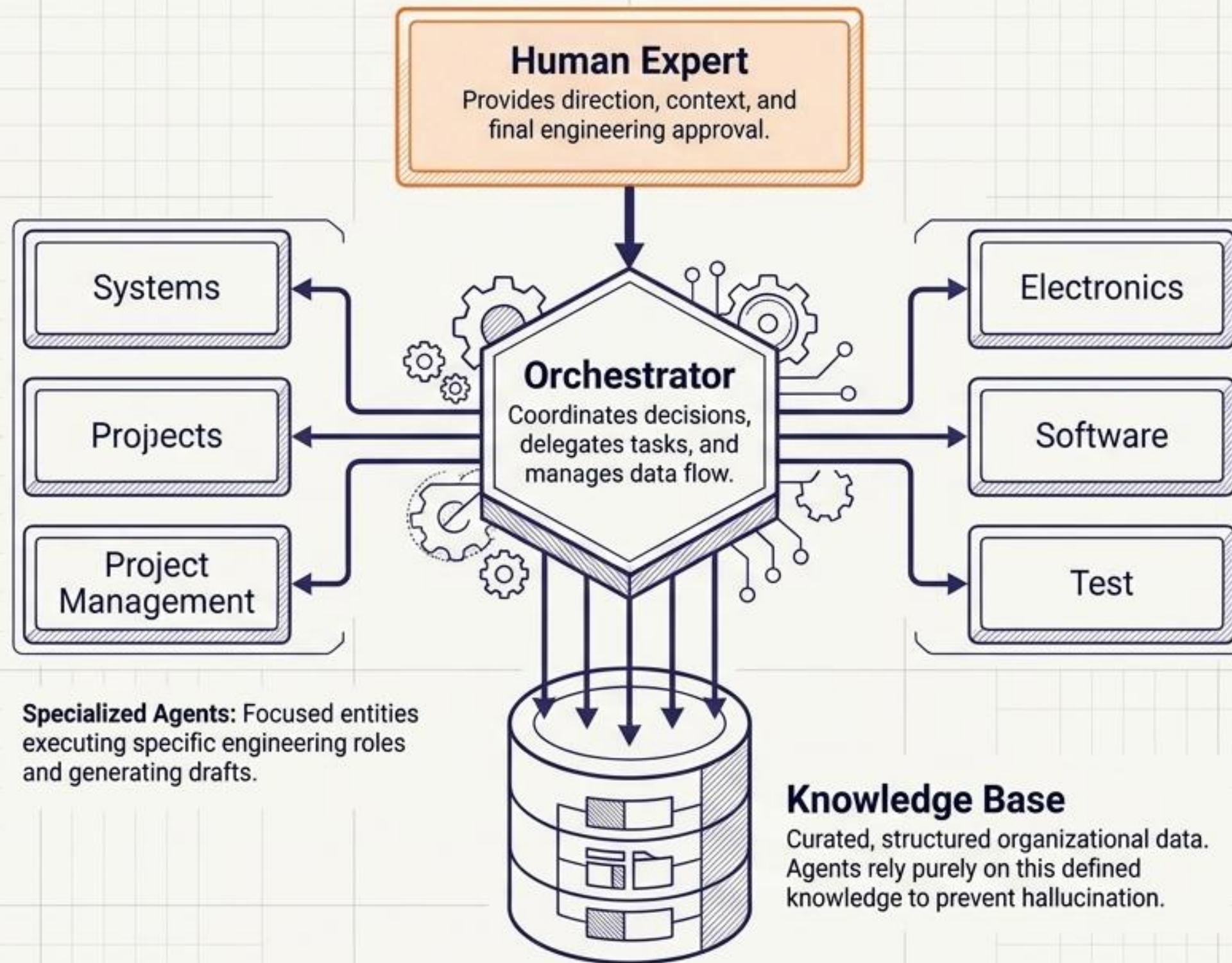
- Data locked in disparate documents and individual minds.
- High volume of manual, repetitive traceability analysis.
- Risks of misaligned requirements, architectures, and testing.

## The AI Vision



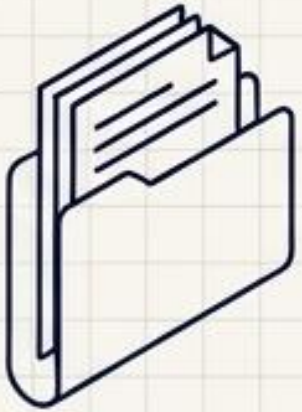
- A coordinated environment of specialized AI junior engineers.
- A force multiplier for gathering data, preliminary analysis, and drafting.
- Human experts are freed to focus purely on critical design decisions.

# The Multi-Agent Engineering Architecture



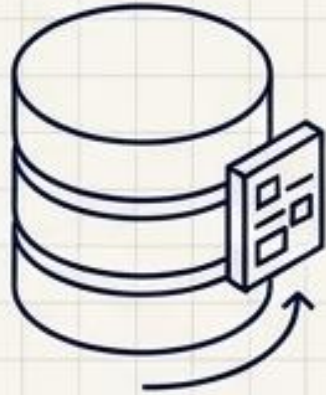
# Strict Division of System Responsibilities

## Storage (OneDrive)



**Raw Data.**  
Houses, backs up,  
and organizes raw  
project files and  
document histories.

## Knowledge Base (DB)



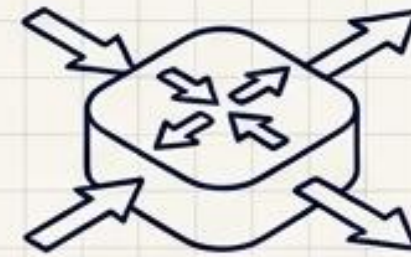
**Accessible Context.**  
Transforms static  
documents into  
searchable,  
contextual data for  
AI consumption.

## Specialized Agent



**Processing.**  
Analyzes specific  
subsets of  
knowledge to identify  
gaps, trace links,  
and generate drafts.

## Orchestrator



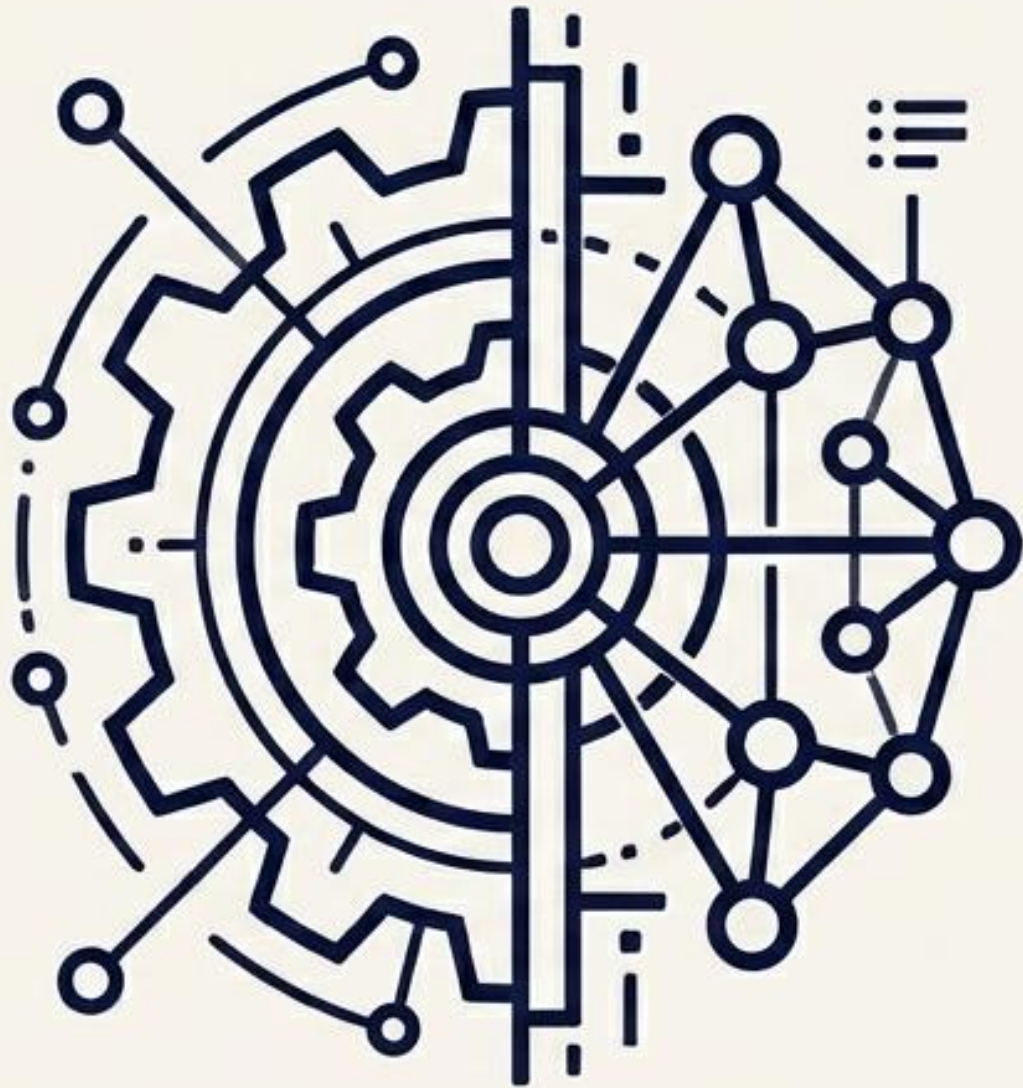
**Traffic Control.**  
Analyzes complex  
queries and routes  
them to the  
appropriate  
specialized agents.

## User / Expert



**Authority.**  
Initiates queries,  
reviews outputs,  
corrects errors, and  
grants regulatory and  
engineering approval.

# Profile: Systems Engineering Agent



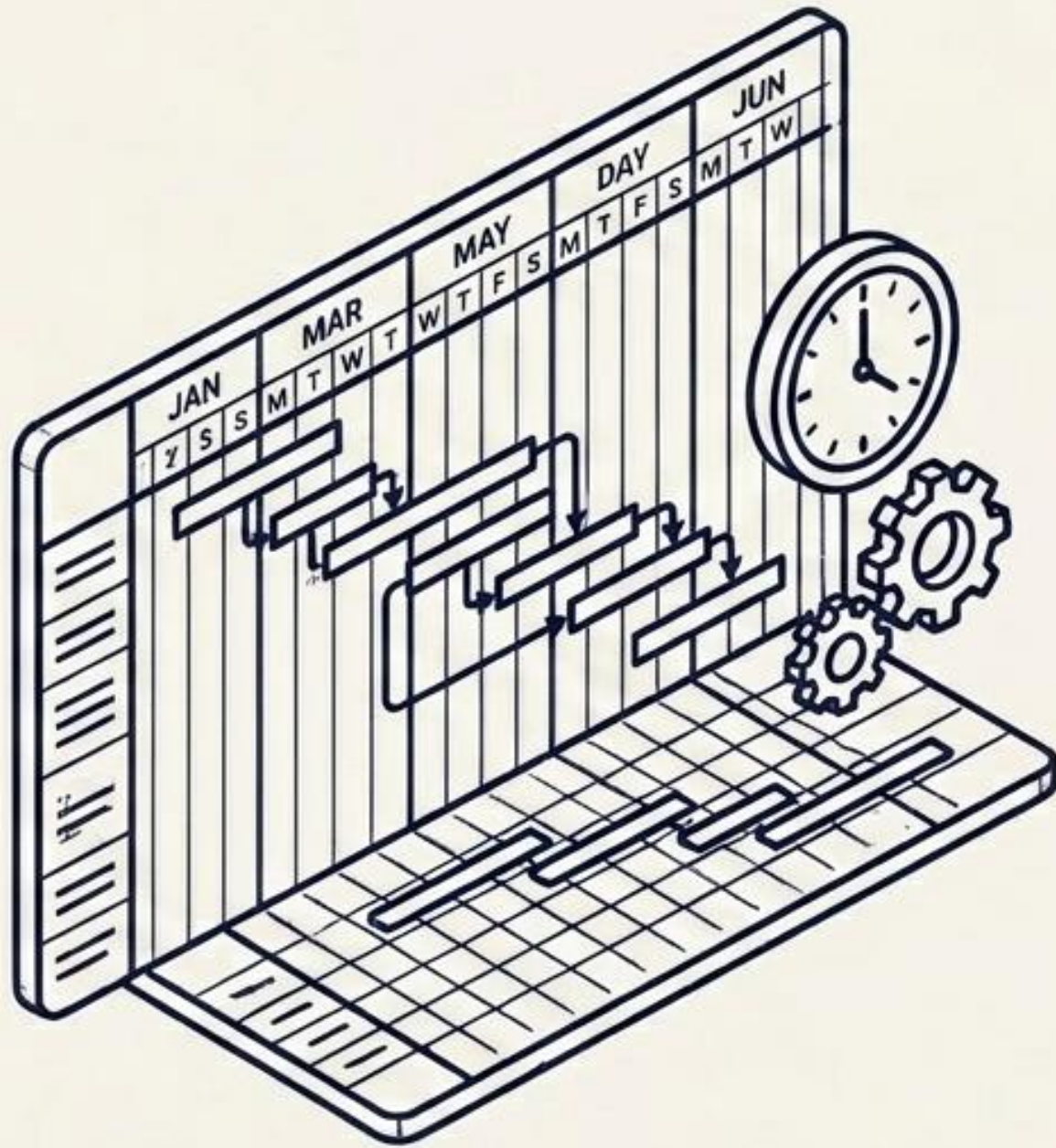
## Core Focus

- Multidisciplinary system architecture definition.
- Requirements analysis, allocation, and traceability.
- Trade-off and risk analysis.
- Lifecycle and Verification & Validation (V&V) planning.

## Key Outputs

- Requirement documents and traceability matrices.
- Interface Control Documents (ICD) draft support.
- Gap analysis and design review summaries.

# Profile: Project Management Agent



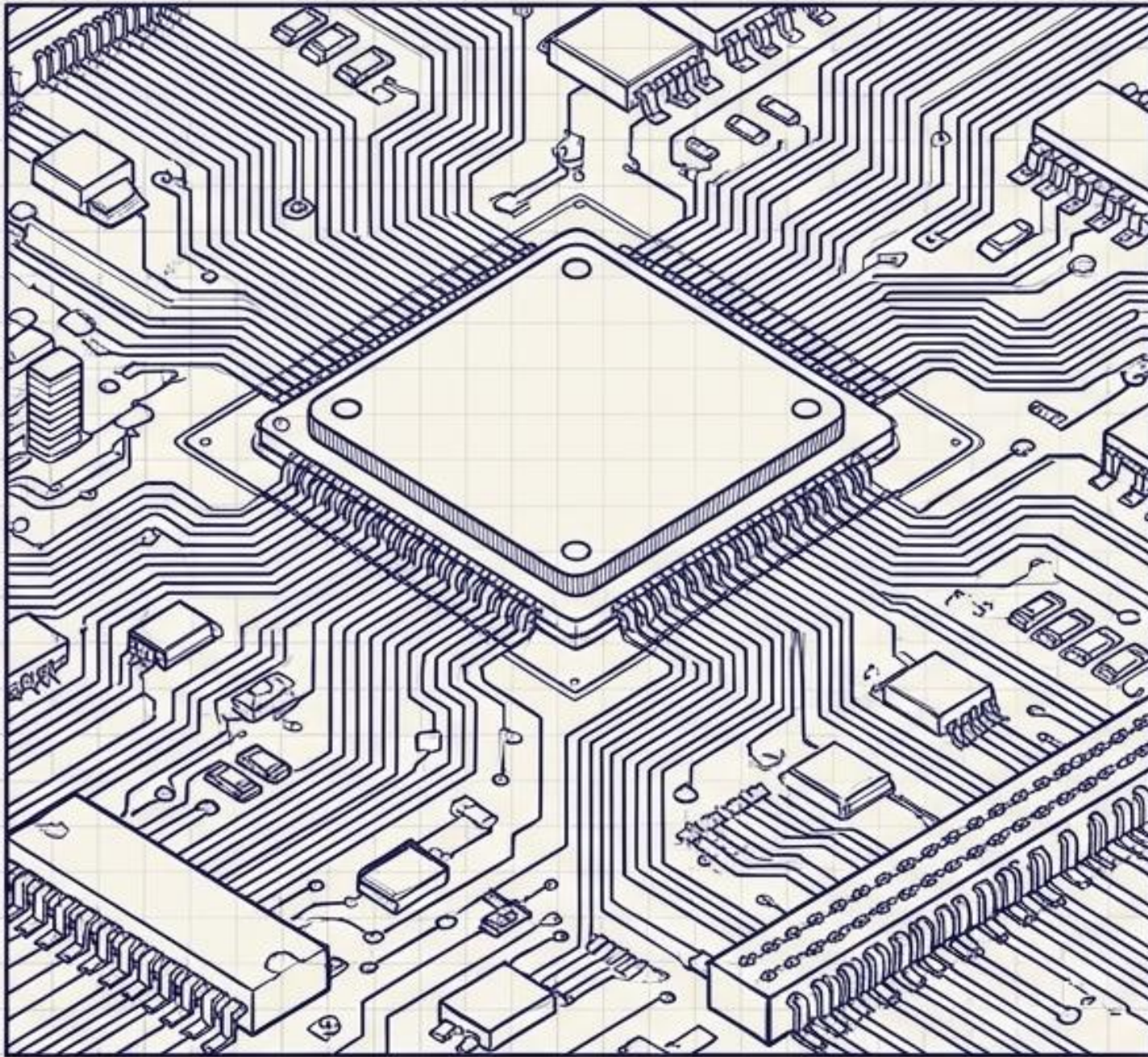
## Core Focus

- Simultaneous management of multiple engineering projects.
- Resource coordination and task allocation tracking.
- Technical-to-management translation and alignment.
- Decision support based on project constraints.

## Key Outputs

- Project schedules and work plans.
- Automated project status summaries.
- Risk tracking matrices and mitigation logs.
- Open action-item tracking.

# Profile: Electronics Design Agent



## Core Focus

- Electronic architecture and communication recommendations (e.g., Ethernet).
- Trade studies (e.g., FPGA vs. MCU architectures).
- Redundancy, thermal, and power architecture planning.
- Component selection support and MTBF (Reliability) concepts.

## Key Outputs

- Power budget calculations.
- Thermal and reliability estimations.
- Preliminary electronic architecture drafts.

# The Junior Engineer Paradigm

AI acts as an engineering multiplier, not a full replacement.

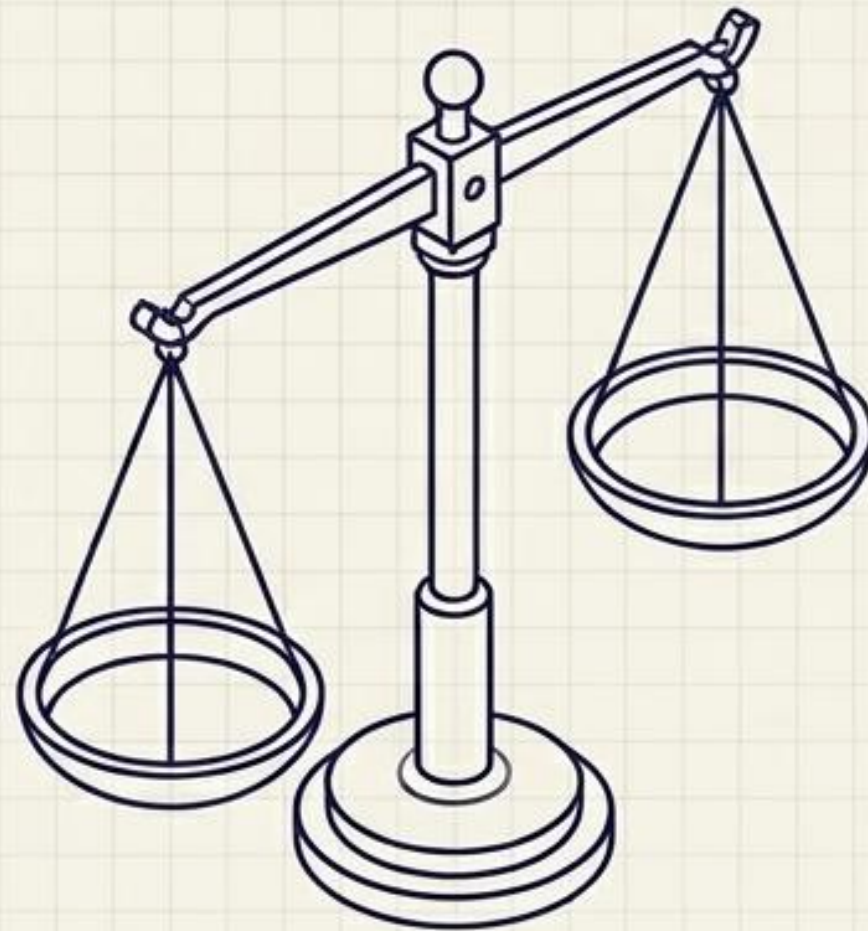


**AI Sweet Spot**  
(What It Excels At)

- System-level multi-disciplinary integration.

- Requirements management and massive traceability checks.

- Architecture trade studies and rapid documentation generation.



**Human Imperative**  
(System Limitations)

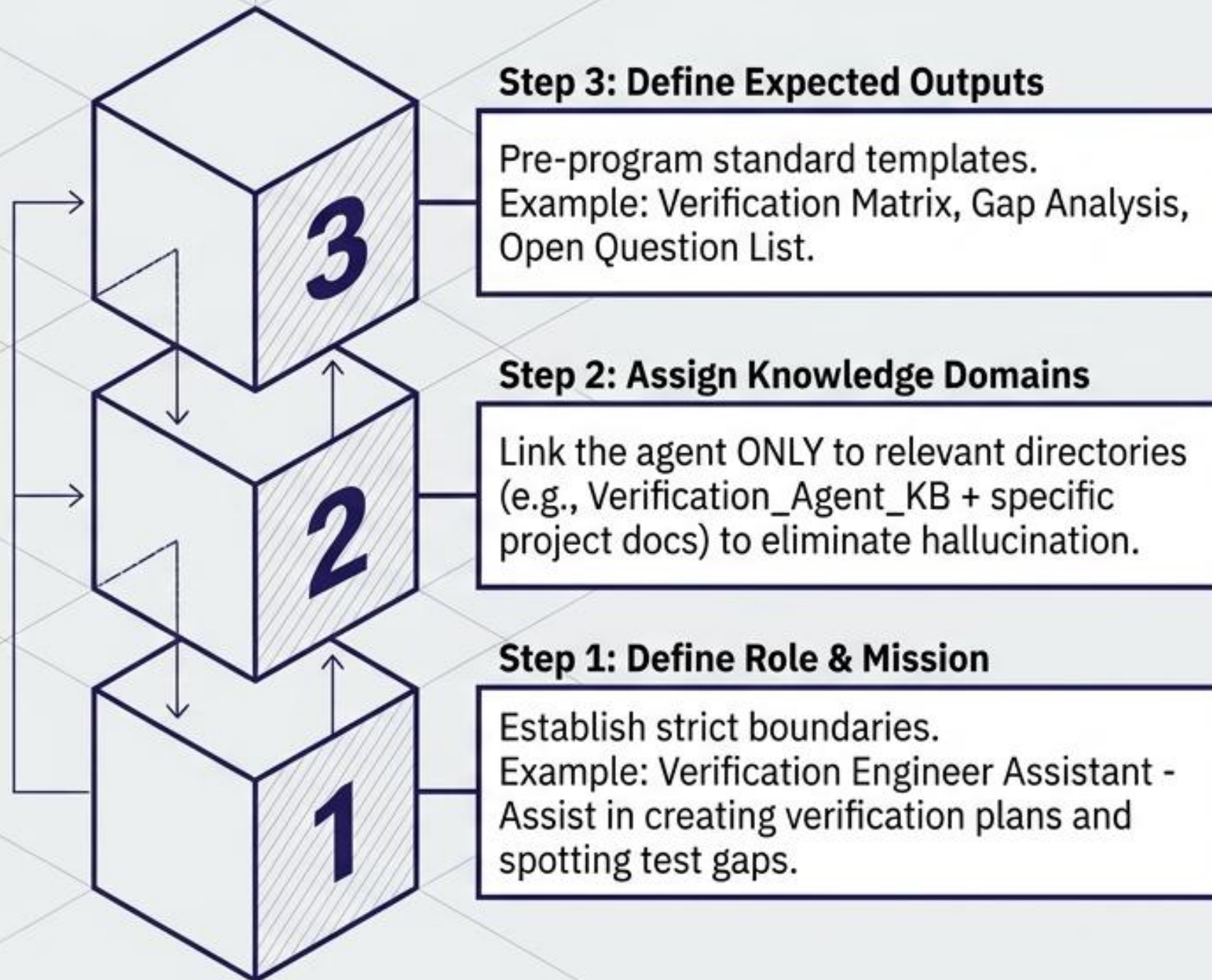


- Safety-critical certification and regulatory approvals.

- Detailed expert routing (e.g., full professional PCB routing).

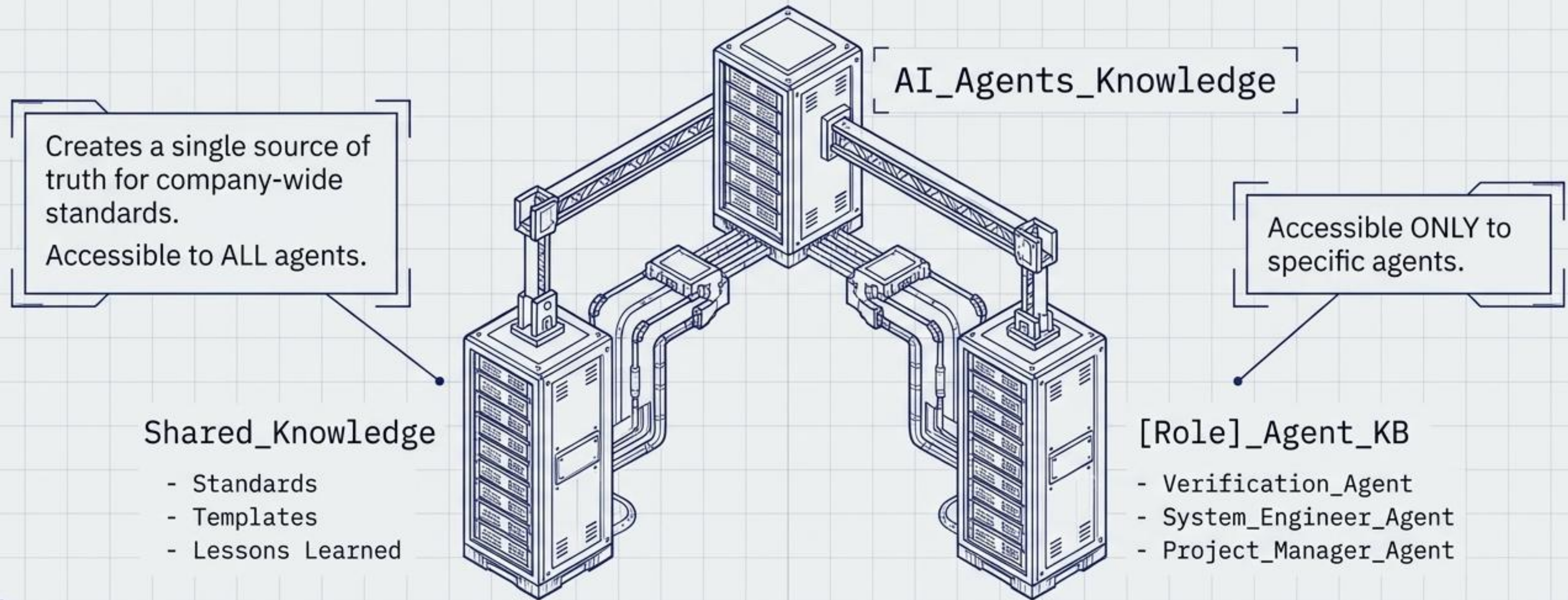
- Advanced physical optimization (e.g., High-speed SI/PI tuning, intricate RF design).

# Anatomy of a Specialized Agent Configuration



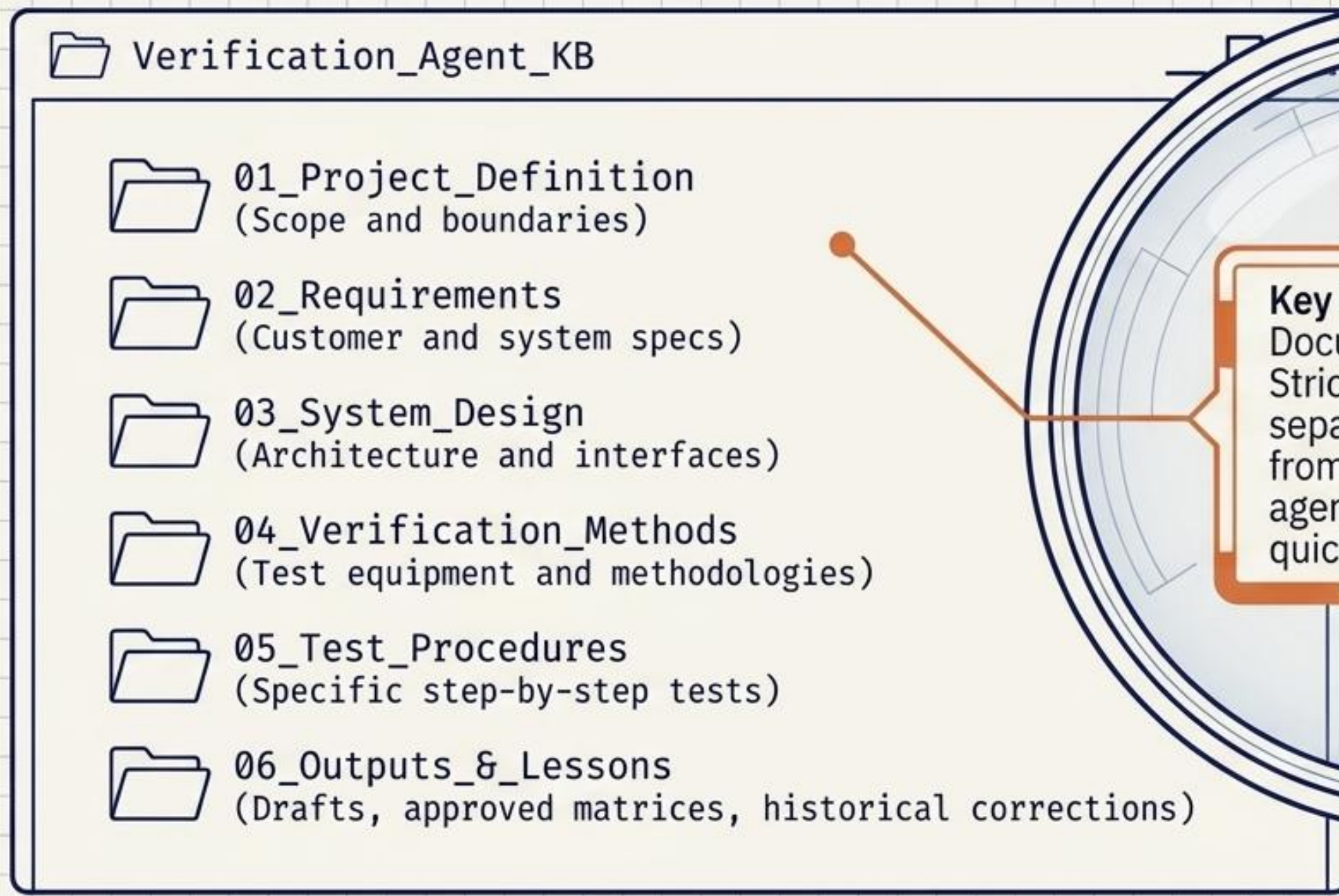
Agents are interchangeable processing engines. The structural definition and data are what provide the actual engineering value.

# The Knowledge Vault: Folder Ontology



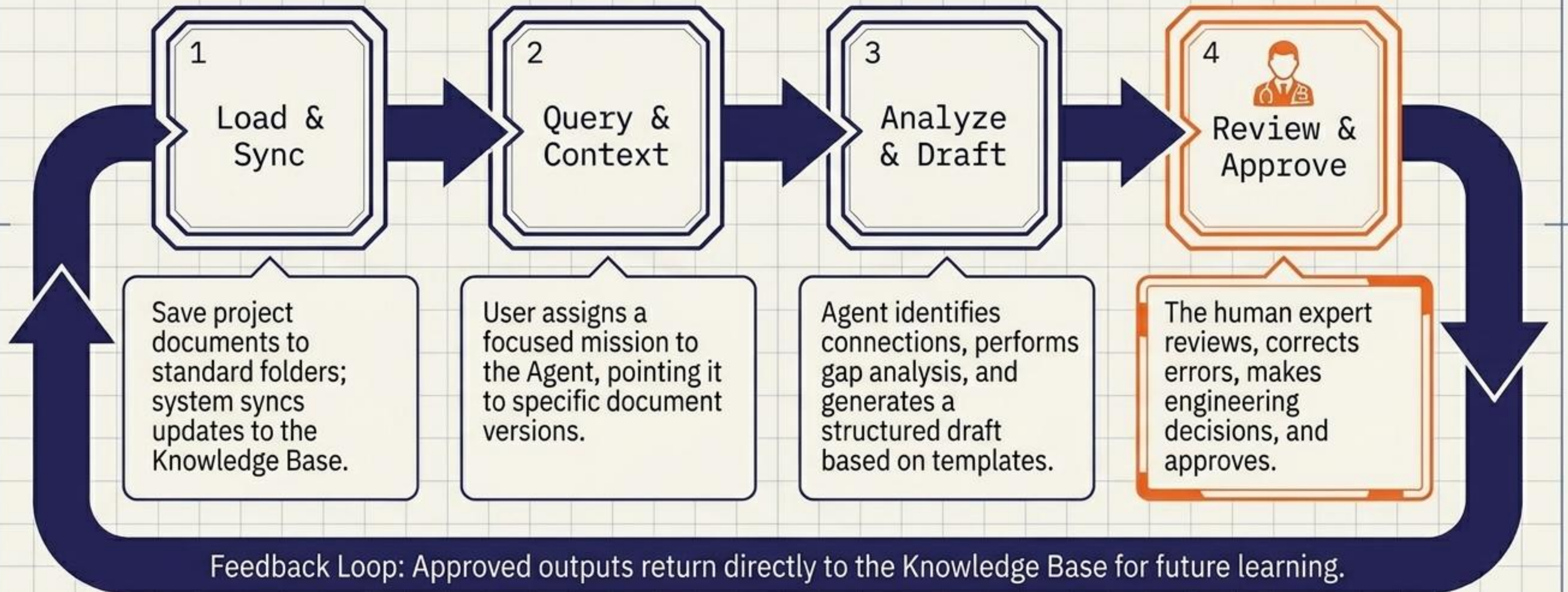
If an AI model changes tomorrow, this exact knowledge structure remains intact.

# Structuring an Agent's Brain



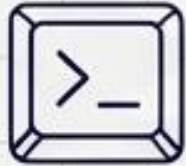
**Key Principle:** One Document = One Topic. Strict separation (e.g., separating Requirements from Interfaces) allows the agent to find precise context quickly.

# The Operational Human-in-the-Loop Workflow



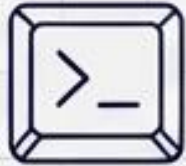
# Prompting Like an Engineer

Treat the agent like a junior engineer: provide clear tasks, strict scope, and desired output formats.



## Requirements Analysis

> Analyze the V2 requirements document against the customer SOW.  
Generate a list of missing or ambiguous requirements in a table format.



## Traceability Generation

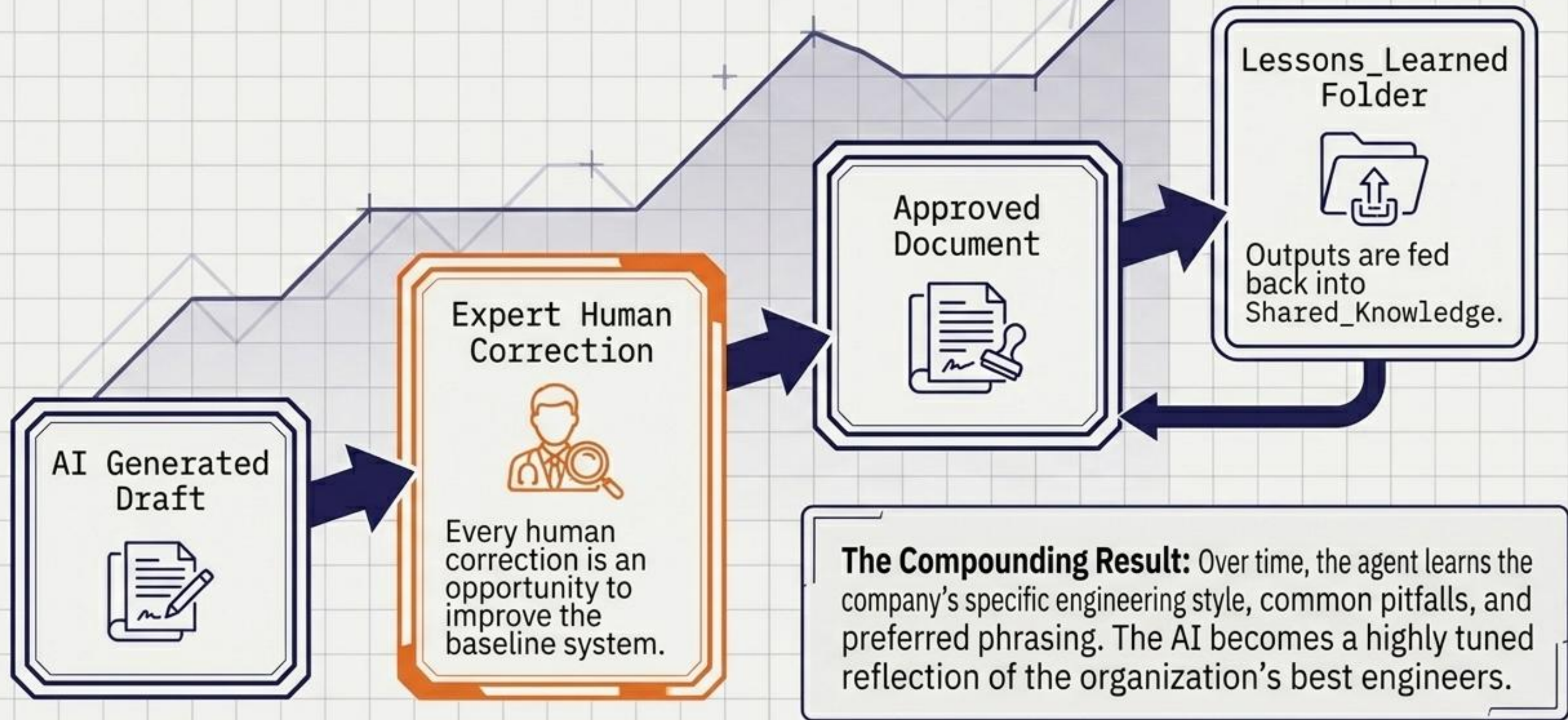
> Build a traceability matrix connecting the Customer Requirements in Folder 02 to the System Design Interfaces in Folder 03.



## Quality Assurance

> Review the draft Verification Plan. Flag any system requirements that do not have a defined test methodology.

# Capturing Institutional Memory



# System Summary & The Path Forward

- ✓ - Organized knowledge is the foundation; agents are just interchangeable processors.
- ✓ - Rigid folder structures ensure accuracy and easy AI upgrades.
- ✓ - **Human experts** strictly retain all engineering authority and final sign-off.
- ✓ - The system drastically improves multi-disciplinary traceability and coordination.

