LTM

WHITEPAPER

AI-Powered PI Administration Using Microsoft 365 Copilot Agents

A Governance-First Framework for Crafting Scalable Industrial Data Operations

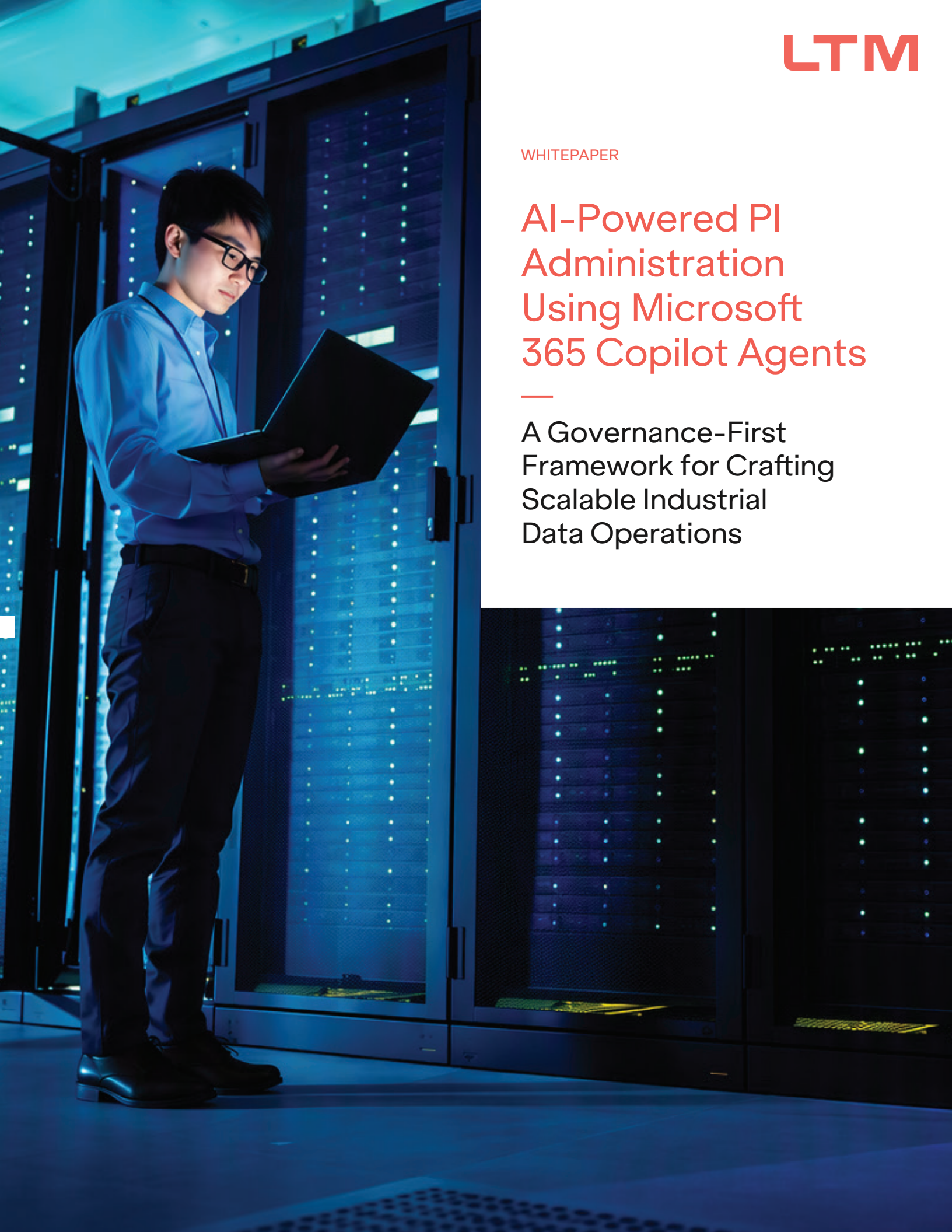


Table of Contents

Executive Summary 3

Industrial Data Management Challenges in PI Ecosystems 4

Operational Challenges in PI System Administration 5

Barriers to Scalable PI Administration and Governance 6

LTM's Perspective on AI-Driven PI Operations 7

Copilot-Driven Framework for PI Administration 8

Architecture of the AI-Powered PI Administration Solution 9

Business Value and Operational Benefits 11

Real-World PI Administration Use Cases 13

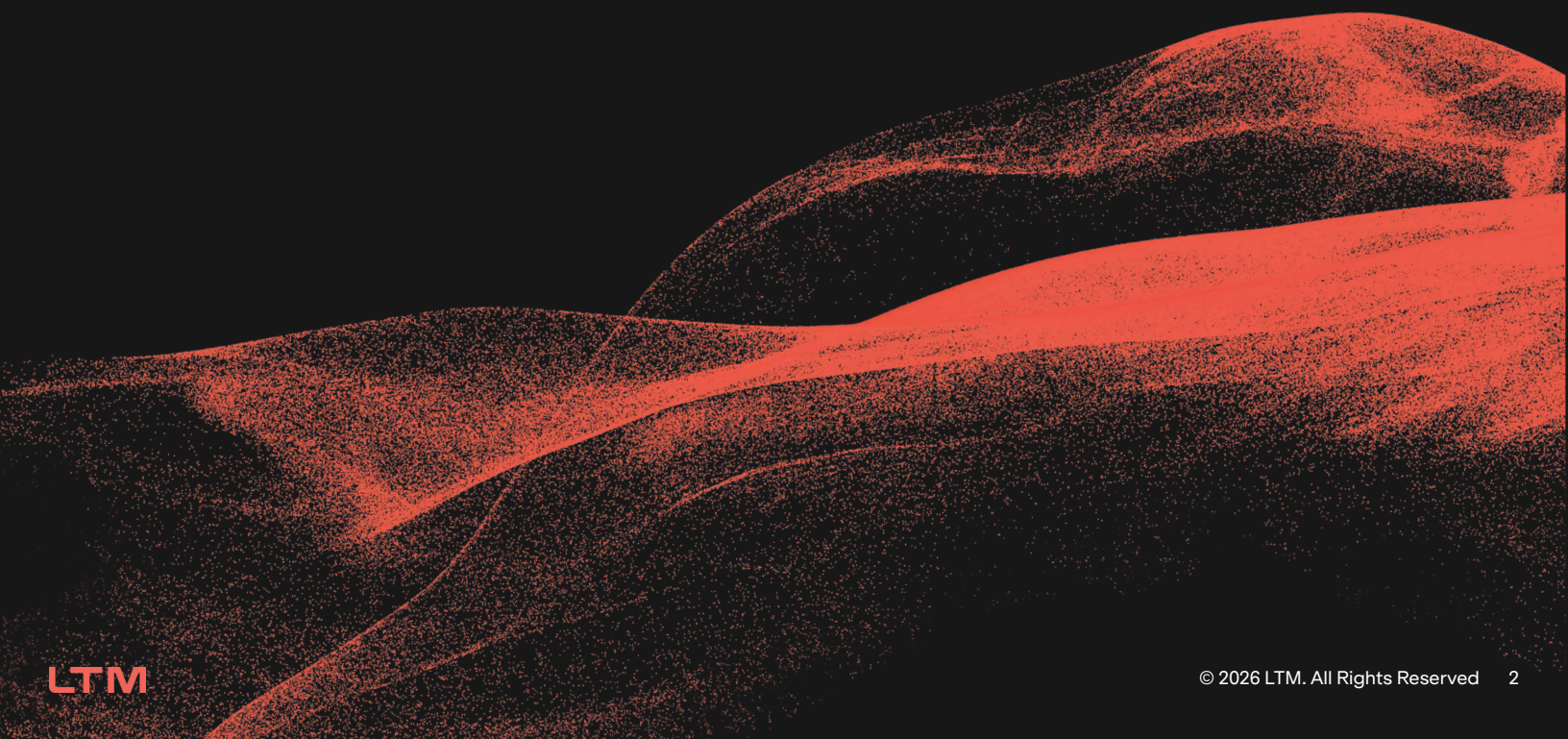
Future of AI-Augmented Industrial Data Operations 14

Strategic Recommendations for PI Modernization 15

Conclusion 16

References 17

About the Authors 18



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Executive Summary

Industrial AI programs increasingly depend on the quality, consistency, and context of operational data. In AVEVA PI System environments, that foundation is often shaped by Aveva PI tag onboarding, metadata validation, naming-standard enforcement, PI Builder preparation, and Asset Framework readiness. These activities are essential, but they are still commonly executed through manual spreadsheet-driven processes. As digital programs scale across plants, migration waves, and analytics use cases, this manual operating model creates avoidable delays, inconsistent outputs, weak traceability, and rework.

This white paper presents a controlled, human-approved approach for using Microsoft 365 Copilot Agents to streamline PI administration. The central thesis is clear: AI-powered PI administration can reduce manual historian-administration effort while improving standardization, traceability, and governance, provided the agent is constrained by deterministic PI rules and mandatory human approval. The proposed model builds on the Intelligent PI Tag Builder Powered by Copilot concept and is positioned as an external thought-leadership framework rather than a product pitch. The agent supports conversational file intake, schema validation, parsing, deterministic PI rule execution, post-rule validation, exception reporting, and controlled generation of PI Builder-compatible outputs. The large language model supports interaction, explanation, summarization, and workflow orchestration; approved PI rules determine the final engineering artifacts.

The recommended operating model starts with a file-based minimum viable product. Engineers upload CSV or Excel mapping files, receive validation feedback, review generated PI Builder-ready files, and approve outputs before any production change. The minimum viable product does not perform direct writes to the production PI environment. This boundary protects historian integrity while allowing the organization to validate productivity, quality, and operational-control benefits under controlled conditions.

The broader opportunity is to transform repetitive PI administration into a repeatable, auditable, and human-approved workflow. This structured operating model enables organizations to improve engineering productivity, data quality, auditability, and AI readiness without bypassing historian control boundaries. Over time, the same foundation can support Asset Framework template readiness, asset attribute mapping, analytics preparation, ruleset management and controlled enterprise integration. Business value should be measured through cycle time, validation pass rate, correction frequency, output acceptance rate, approval turnaround, and standardization across sites. Quantified improvement claims should be published externally only after a controlled pilot establishes a baseline and validates results.



Industrial Data Management Challenges in PI Ecosystems

Industrial enterprises across manufacturing, energy, utilities, oil & gas, and process industries are accelerating investments in Industry 4.0 Industrial AI, smart manufacturing, predictive maintenance, quality optimization, energy management, and real-time operational analytics.These programs require trusted operational data from control systems, connected assets, industrial networks, sensors, and historian platforms. AVEVA describes the AVEVA PI System as an integrated portfolio that collects, cleanses, stores, enriches, and visualizes real-time operations data with IT compliance. AVEVA also highlights data contextualization, asset frameworks, secure delivery of reliable data, and integration with analytics and AI tools as core value areas.

Market indicators reinforce the same direction. Grand View Research reports that the global artificial intelligence in manufacturing market was valued at USD 5.3 billion in 2024 and projects it to reach USD 47.9 billion by 2030, at a compound annual growth rate of 46.5% from 2025 to 2030. Research by MarketsandMarkets estimates [PJ1.1]a larger market scope, projecting the AI in manufacturing market from USD 34.18 billion in 2025 to USD 155.04 billion by 2030, at a compound annual growth rate of 35.3%. The estimates differ because research firms use different market definitions and methodologies; however, both point to rapid growth in AI-enabled industrial operations.

The implication for PI administration is direct. As plants scale analytics, digital twins, production optimization, and reliability use cases, historian data must be searchable, contextualized, standardized, and traceable. Tag naming, metadata completeness, engineering units, point types, descriptors, and asset context are not administrative details; they are prerequisites for trustworthy analytics and scalable Industrial AI.

MARKET TREND	IMPLICATION FOR PI ADMINISTRATION
Industrial AI growth	More AI and analytics use cases require trusted historian data and standardized metadata.
Multi-site digital programs	Common rules are needed for naming, units, descriptors, point types, and Asset Framework readiness across plants.
Agentic enterprise automation	Microsoft 365 Copilot Agents can extend Copilot with domain-specific knowledge, actions, and workflow orchestration.
Responsible AI expectations	Human oversight, transparency, fit-for-purpose evidence, data governance, and ongoing monitoring must be built into the operating model.

Table 1: Key Market Trends and Their Implications for PI Administration

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Operational Challenges in PI System Administration

PI administration is a critical but repetitive activity in historian modernization and Industrial IoT programs. Engineering teams often receive mapping files from control systems, migration utilities, legacy historians, or project teams and then manually convert them into PI-ready structures. The work includes identifying relevant rows, deriving PI tag names, assigning point types, mapping engineering units, populating descriptors, preparing PI Builder-compatible templates, and resolving exceptions.

The challenge is not a lack of engineering expertise. The challenge is that expert time is consumed by low-value administrative steps that must still be performed correctly. When different teams or sites apply conventions differently, downstream Asset Framework models, calculations, visualizations, reports, and analytics become harder to govern. Small metadata errors can propagate across the industrial data chain and create rework during commissioning, analytics development, and operational reporting.



BUSINESS CHALLENGE	OPERATIONAL CONSEQUENCE
Manual spreadsheet processing	Longer onboarding cycles and higher dependency on individual engineer availability.
Inconsistent naming rules	Reduced searchability, fragmented reporting, and weaker cross-site comparability.
Missing or incorrect metadata	Rework during engineering review, commissioning, and analytics development.
Late exception discovery	Issues are often found after effort has already been spent on formatting or reviewing outputs.
Limited audit trail	Difficulty proving how a tag list was created, reviewed, changed, and approved.

Table 2: Key Pain Points in PI System Administration and Their Impact on Operations

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Barriers to Scalable PI Administration and Governance

Adoption of AI-assisted PI administration is affected by technology, governance, operating model, trust, and change-management concerns. These barriers must be addressed before a promising prototype can become a repeatable enterprise capability.

BARRIER	IMPACT	MITIGATION
Reliability concerns	Historian configuration errors can affect operational decisions.	Use deterministic rules, explicit validation, and mandatory engineering review.
Data sensitivity	Mapping files may include site, equipment, server, naming, or security details.	Use approved repositories, access control, least privilege, and publication sanitization.
Tool trust	Engineers may not trust AI-assisted outputs without explainability.	Provide validation reports, rule explanations, exception summaries, and change history.
Schema variability	Mapping files differ across plants, projects, and source systems.	Use pre-validation, column mapping, normalization, and exception queues.
Control-model gaps	Uncontrolled agents can create inconsistent outputs and ownership gaps.	Define ruleset owners, versioning, retention, approval workflows, and audit logs.
Change management	Teams may resist automation if it appears to bypass engineering judgment.	Position the agent as an engineering accelerator, not an autonomous configuration engine.

Table 3: Key Barriers to Scalable AI-Assisted PI Administration and Recommended Mitigation Strategies





LTM's Perspective on AI-Driven PI Operations

Adoption of AI-assisted PI administration is affected by technology, governance, operating model, trust, and change-management concerns. These barriers must be addressed before a promising prototype can become a repeatable enterprise capability.

AI-powered PI administration should therefore be implemented as a controlled engineering accelerator rather than an autonomous configuration engine. LTM's point of view is that Copilot Agents should augment expert PI administrators by removing repetitive preparation effort, surfacing exceptions earlier, enforcing approved rules consistently, and preserving traceability across the data lifecycle. The recommended model combines deterministic PI administration rules, human oversight, explainable AI interaction, enterprise governance controls, and end-to-end auditability. This enables organizations to improve engineering productivity while preserving data quality, operational reliability, and compliance discipline.

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Copilot-Driven Framework and Methodology for PI Administration

The proposed methodology uses a six-stage operating model in which validation operates as a continuous control rather than a single late-stage activity. Validation occurs before parsing, after deterministic rule execution, and during engineering review. Governance functions as a control plane across the complete workflow.

STAGE	PURPOSE	KEY OUTPUTS
Intake	Receive mapping files and processing intent through the Microsoft 365 Copilot Agent interface.	Uploaded file, user intent, site or project context.
Pre-validation	Check file type, headers, required columns, schema, permissions, and mandatory values before processing.	Pre-validation report and exception list.
Parse and normalize	Extract source fields, identify tag groups, normalize units and descriptors, and create a structured intermediate dataset.	Clean source data model ready for rule execution.
Apply deterministic PI logic	Apply approved PI naming, point type, engineering unit, descriptor, metadata, and Asset Framework readiness rules.	PI tag candidates, attributes, and rule execution metadata.
Post-rule validation and triage	Check duplicates, missing attributes, unsupported values, naming exceptions, and low-confidence rows.	Validation report, exception report, and correction queue.
Generate, review, and govern	Create PI Builder-compatible outputs, route them for engineering review, and retain logs, version records, and approval metadata.	PI Builder-ready Excel/CSV file, approval trail, audit log, and KPI dataset.

Table 4: End-to-End Workflow for AI-Assisted PI Tag Generation and Validation

The workflow intentionally starts with file-based outputs. AVEVA documentation describes PI Builder as a Microsoft Excel add-in that lets users create, view, and edit PI points in Data Archive and objects in a PI Asset Framework database. It also supports bulk creation, editing, and deletion of PI points and PI point attributes. This makes PI Builder-compatible output a practical first-phase boundary for engineer-reviewed automation.

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Architecture of the AI-Powered PI Administration Solution

The architecture in Figure 1 represents two connected views: the current minimum viable product and the future-state evolution. The main flow moves left to right through the Copilot Agent interface, file intake, pre-validation, parsing and normalization, deterministic PI rules engine, post-rule validation, output package generation, engineering approval, and then manual PI Builder import or controlled change workflow. The governance control plane spans the complete flow and covers approved repositories, ruleset versioning, audit logs, access control, Responsible AI assessment, security review, and change-management controls.

The diagram also adds feedback loops. Exceptions must flow back to mapping-file correction and schema improvement. Engineering review findings must flow back to ruleset refinement. Governance is shown as a control plane because it applies throughout the workflow, not only after output generation. This includes approved repositories, ruleset versioning, audit logs, access control, responsible AI assessment, security review, and change-management controls.

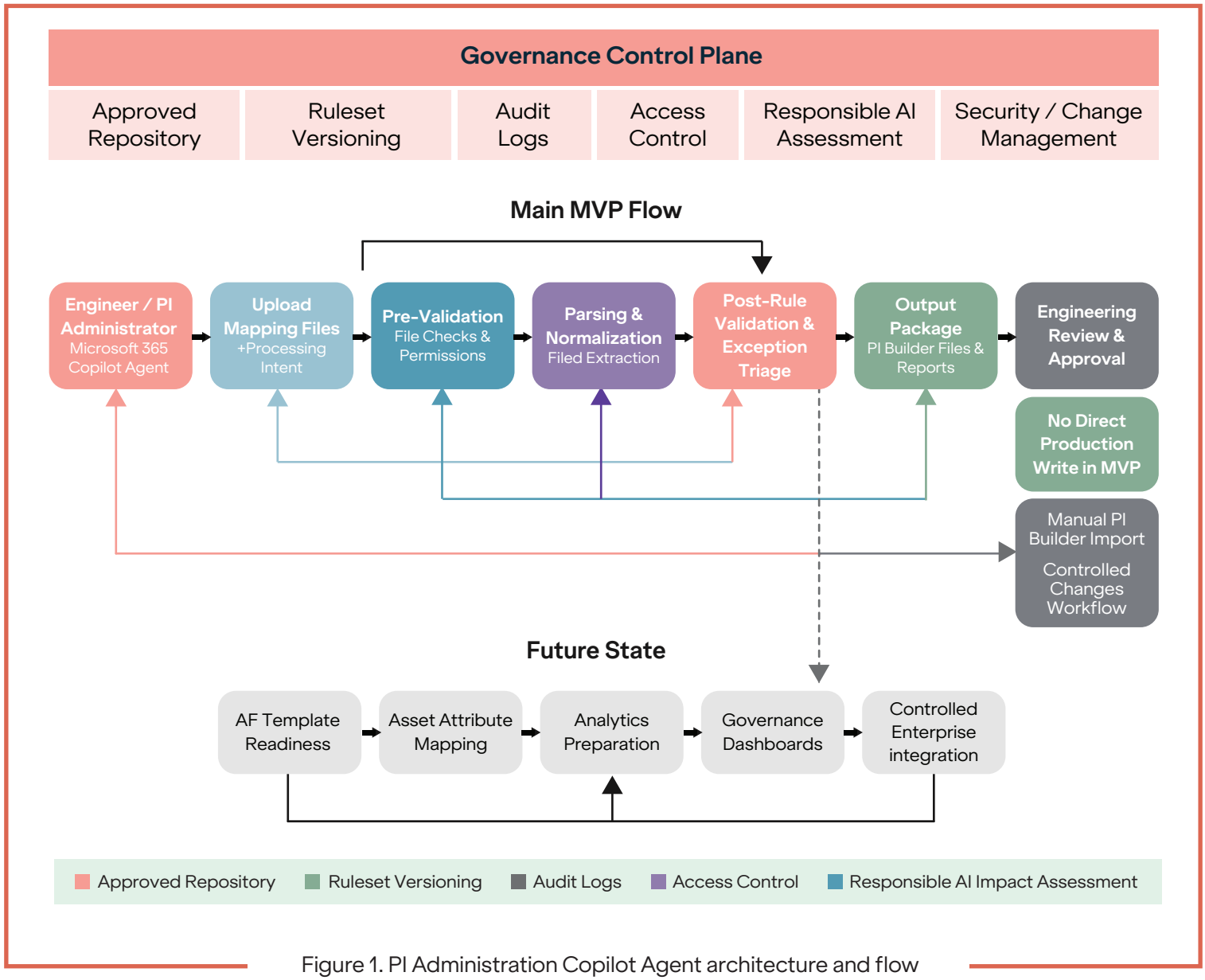

Figure 1. PI Administration Copilot Agent architecture and flow

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ARCHITECTURE COMPONENT	ROLE IN THE PROPOSED ARCHITECTURE	EXPECTED OUTCOME
Microsoft 365 Copilot Agent interface	Provides conversational intake and workflow orchestration. Microsoft describes Copilot agents as specialized AI assistants that can use knowledge and actions to streamline business processes.	User-friendly entry point for PI administrators and OT data teams.
Pre-validation	Checks file type, headers, required columns, schema, and permissions before parsing.	Early anomaly detection and reduced downstream rework.
Parsing and normalization	Extracts fields, identifies tag groups, and creates a structured intermediate dataset.	Reusable source model for deterministic rule execution.
Deterministic PI rules engine	Applies approved naming, point type, metadata, engineering unit, descriptor, and AF-readiness rules.	Consistent PI tag candidates and standardized attributes.
Post-rule validation and exception triage	Checks duplicates, missing attributes, unsupported values, naming exceptions, and low-confidence rows.	Clear exception queue and higher output quality.
Output package	Exports PI Builder-compatible Excel/CSV outputs with validation and exception reports.	Engineer-review-ready PI tag list and supporting evidence.
Engineering approval boundary	No direct production writes in the minimum viable product. Outputs are reviewed before import or controlled change execution.	Historian integrity and human accountability.
Governance control plane	Stores inputs, outputs, logs, ruleset versions, approval metadata, and KPI evidence.	Traceability, auditability, and scalable oversight.

Table 5: Architecture Components and Functional Roles in the Proposed PI Administration Copilot Solution

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Business Value and Operational Benefits

The business case can be understood through five executive value themes: productivity, data quality, governance, scalability, and AI readiness. These themes describe the expected business value, while the pilot KPI framework provides a controlled method for establishing baselines and validating outcomes. Potential productivity and standardization benefits should be treated as measurement hypotheses until a controlled pilot establishes representative baselines and validates the resulting outcomes. Microsoft Responsible AI guidance states that AI systems should be fit for purpose, evaluated, documented, monitored, and communicated with care about system benefits.

BENEFIT THEME	EXECUTIVE VALUE NARRATIVE
Productivity	Reduces repetitive spreadsheet preparation effort so PI administrators can focus on higher-value engineering judgment, exception resolution, and continuous improvement of PI standards.
Data quality	Improves consistency in naming, mandatory fields, descriptors, engineering units, point types, and AF-readiness checks through deterministic rules and validation gates.
Governance	Creates traceable evidence across input files, rule versions, validation results, approvals, and output packages.
Scalability	Supports repeatable multi-site onboarding and historian modernization by applying centrally managed rules across projects and plants.
AI readiness	Strengthens the trusted operational data foundation needed for analytics, digital twins, predictive maintenance, and Industrial AI use cases.

Table 6: Business Value and Expected Benefits of AI-Assisted PI Administration

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A controlled pilot should use measurement hypotheses until validated baseline data is available. The pilot should compare representative mapping files against manual baselines and capture both productivity and quality outcomes.

KPI	BASELINE TO CAPTURE	PILOT MEASUREMENT APPROACH
PI tag generation effort	Manual effort required to prepare a PI Builder-ready file.	Measure engineering person hours before and after agent-assisted preparation.
Validation pass rate	Initial defect rate across naming, mandatory fields, duplicates, and unsupported values.	Track first-pass and post-correction validation rates.
Correction frequency	Number and type of corrections per mapping file.	Classify defects by schema, naming, metadata, duplicate, and unsupported-value categories.
Output acceptance rate	Percentage of generated rows accepted by engineering review.	Measure accepted, corrected, rejected, and deferred rows.
Approval turnaround	Time from upload to engineer-approved output.	Measure cycle time from intake to approval.
Governance traceability	Availability of input, output, rule version, reviewer, and approval record.	Confirm audit trail completeness for every pilot run.

Table 7: Pilot KPIs and Measurement Approach for Evaluating AI-Assisted PI Administration



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Real-World PI Administration Use Cases

The following anonymized scenarios illustrate how the framework may apply across common historian-modernization and industrial-data-management contexts. These conceptual examples do not represent measured or approved client outcomes.

SCENARIO	STARTING CHALLENGE	AGENT-ASSISTED OUTCOME
Multi-site historian onboarding	A manufacturing enterprise needs consistent tag onboarding across plants using different source naming patterns.	A shared ruleset standardizes tag names and metadata while validating outputs before engineering approval.
Legacy historian migration	An operations team receives large mapping files for migration from a legacy historian and must prepare PI Builder-compatible files.	The agent validates required columns, flags exceptions, and generates review-ready workbooks.
Asset Framework readiness	A digital transformation team plans to contextualize tags in Asset Framework after PI point creation.	The framework captures asset context and prepares structures that support future AF template and attribute mapping.
Analytics preparation	A reliability team needs trusted tags before deploying standard calculations.	Validation summaries improve confidence in input quality before analytics configuration begins.

Table 8: Illustrative PI Administration Scenarios and Potential Outcomes



Future of Autonomous PI Operations

The industrial sector is moving beyond isolated AI use cases toward integrated operational AI systems that can support engineering, maintenance, asset performance, and decision-making processes. As organizations scale Industrial AI initiatives, the importance of trusted operational data, standardized metadata, contextual asset models, and controlled, auditable automation will continue to increase. Data readiness is expected to become a critical success factor for enterprise AI adoption.

Emerging agentic AI technologies are expected to augment engineering workflows by assisting with repetitive configuration, validation, documentation, and compliance and control tasks. Rather than replacing engineering expertise, these solutions are likely to operate under structured human oversight, enabling subject matter experts to focus on higher-value activities while improving consistency and reducing manual effort.

For PI System environments, future capabilities may extend beyond tag creation to include automated metadata validation, Asset Framework model preparation, analytics rule recommendations, exception management, control monitoring and lifecycle documentation. However, enterprise adoption is expected to remain dependent on robust operating-control frameworks, security controls, data quality standards, Responsible AI practices, and formal change-management processes.

Organizations that successfully combine AI assistance with standardized engineering workflows and strong governance controls will be better positioned to scale industrial data management initiatives and accelerate digital transformation programs.

HORIZON	EXPECTED EVOLUTION
Near term	File-based PI tag generation, validation reports, exception reports, and controlled engineer review.
Mid term	Reusable AF template mapping, asset attribute preparation, analytics rule preparation, and multi-site ruleset management.
Long term	Enterprise-controlled Industrial AI platforms capable of supporting enterprise-wide operational data management, automated compliance reporting, contextual asset intelligence, and tightly controlled integration with industrial systems.

Table 9: Roadmap for the Evolution of AI-Assisted PI Administration Capabilities

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Strategic Recommendations for PI Modernization

To maximize the value of AI-powered PI administration while ensuring governance, reliability, and scalability, organizations should consider the following recommendations:

Launch a narrow, controlled pilot focused on PI tag generation and validation from representative mapping files, with manual engineering approval retained as a mandatory control.

Establish an approved deterministic PI ruleset covering naming standards, mandatory metadata, point types, engineering units, descriptors, AF-readiness indicators, and PI Builder output structure.

Keep the first release file-based and engineer-reviewed; avoid direct production writes until operational-control, validation, and change-management evidence is mature.

Define LTM delivery controls across ownership of templates, rules, logs, storage locations, permissions, retention, approval workflows, and ruleset change control.

Embed Responsible AI controls, including intended-use documentation, known limitations, human oversight, monitoring, feedback loops, and benefit-claim discipline.

Measure business impact through productivity, data quality, operational control, scalability, and AI-readiness themes, supported by pilot KPIs such as cycle time, validation exceptions, output acceptance rate, approval turnaround, and standardization metrics.

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Conclusion

The increasing complexity of industrial data environments is driving the need for more intelligent, scalable, and efficient approaches to PI System administration. Traditional manual processes for tag creation, validation, metadata management, and governance can be time-consuming, error-prone, and difficult to scale across large industrial enterprises.

This white paper demonstrates how Microsoft 365 Copilot Agents can augment PI administration by automating repetitive engineering tasks, improving data quality, accelerating deployment cycles, and enabling greater consistency across PI System implementations. By combining generative AI capabilities with deterministic rules, human oversight, and governance controls, organizations can establish a trusted framework for AI-assisted PI operations.

Ultimately, the opportunity to Outcreate PI administration is not simply about automating PI administration tasks, but about reimagining how they are performed. By combining domain expertise with AI-assisted workflows, organizations can move from repetitive manual engineering toward a more consistent, governed, and scalable approach to PI administration.

As industrial organizations continue their digital transformation journeys, AI-powered PI administration represents a practical step toward smarter data management, increased operational efficiency, and enhanced engineering productivity. Organizations that adopt a phased, governed approach to implementation will be better positioned to unlock the full value of industrial data while maintaining reliability, compliance, and operational control.



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Intelligent PI Tag Builder Powered by Copilot, Ninad J. Bedmutha. Internal hackathon concept used as the solution driver for this white paper.

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About the Author



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Ninad J. Bedmutha is a Senior Specialist in Industrial IoT with experience in industrial automation, OT systems, historian modernization, and the AVEVA PI System ecosystem. He has led and supported initiatives involving PI tag standardization, Asset Framework enablement, metadata management, and industrial data integration across global projects. His work focuses on building scalable and trusted data foundations that improve operational visibility and enable digital transformation. His current areas of interest include Industrial AI, Microsoft 365 Copilot Agents, agentic AI, and AI-assisted approaches for industrial data management and engineering workflow automation.

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