



AI-led application modernization

A playbook



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Introduction

Governed agentic AI accelerates mainframe modernization — critical for telecom growth and operations.

For enterprises critical business applications on mainframes, modernization is a growth and technology priority. Yet transforming mission-critical systems without disrupting operations remains complex, cost-intensive and high risk.

Traditional programs are manual, sequential and dependent on scarce legacy expertise. With documentation missing, teams must rediscover functionality, reconstruct business rules, map dependencies and validate functional equivalence.

The systems that power the business, therefore, also constrain it. Organizations need to accelerate transformation while preserving business logic, controlling cost and risk, and reducing reliance on a shrinking specialist pool.

Agentic AI is moving from experiment to powering enterprises. The question is whether AI can orchestrate much of the modernization lifecycle within a governed model, with a human's judgment and decisions.

These considerations are particularly significant in telecommunications, where operators are advancing autonomous networks and personalized customer experiences. For both global and regional operators, AI-led modernization establishes a strong foundation for contact center, field-force and agile business operations.

AI-led modernization at a telco

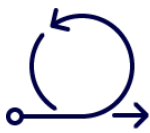
Billing, rating, provisioning and customer operations run on mainframe batch, screen, message queue and data workloads. These estates are expensive to maintain and increasingly difficult to change, as specialist skills continue to decline. Cognizant worked with a leading telecom provider to modernize a complex mainframe estate, spanning batch, online and real-time workloads.

We combined AI-led analysis, AWS AgentCore orchestration and governance to support dependency mapping, business-rule extraction, wave planning, architecture selection, code modernization and test

validation. We validated four modernization archetypes, which covered 75–80% of the core workload across the legacy landscape, improving productivity and reducing costs. Engagement, expertise and use cases were used to develop a playbook to help telecom organizations modernize their estates.

The Archetypes

Telecom mainframes typically contain four workload patterns.



Batch processing

COBOL and JCL programs supporting billing, rating and settlement.



Online transactions

Customer Information Control System (CICS) environments, supporting customer service, provisioning and order management.



Real-time integration

Message Queue (MQ)-based event flows, preserving message structure and timing for operational workflows, thus ensuring that there is no impact downstream.



Screen automation

Robotic Process Automation (RPA) bots, which were initially created for terminal-based processes, are all retained in the new estate.

Once validated, these archetypes can be reused across the estate, accelerating every subsequent modernization wave.

Use Cases

Four use cases emerged from the engagement.

USE CASE 1

Business rules extraction and forward engineering of a legacy mainframe application

Call charge records generated by payphones were collected. Business rules and application logic from the legacy mainframe system were extracted and applied to forward engineering, enabling modernization while preserving existing business functionality.

USE CASE 2

Online transaction modernization (screen-based)

The billing system accepted invoice information from the operator's core billing applications and stored it for electronic billing. CICS-based online transactions were modernized by transforming the existing user interface into contemporary React and Spring Boot architecture. The modernized application was visually and functionally equivalent to the legacy system, thereby limiting the change management that was required.

Use Cases

USE CASE 3

Legacy integration scenario modernization

The major billing system spanned across mobile and specialized services, supporting billing, invoicing, reporting, message processing and credit assessment functions. The use case demanded modernization of legacy integration workflows involving Message Queue (MQ) messaging and database-trigger-based processing. The target solution replicated existing MQ payload structures and transmission behavior while preserving database trigger functionality, supporting event-driven business processes and system interoperability.

USE CASE 4

Screen-to-application and bot integration modernization

We modernized legacy green screens into React-based interfaces with screen-level validations and access to screenshots only.

The application integrated with existing bots and automation workflows, enabling bots to continue operating seamlessly on the modernized screens.

Key learnings from the engagement

Category	Learning summary
AI acceleration delivered expected efficiency gains	AI-led modernization met the efficiency targets set out in the business case and proved a delivery model ready to scale.
Optimized AI token consumption	Enterprise AI guardrails—tiered model-usage policies, token thresholds and early fixes to issues—kept reruns and costs under control.
Handling of missing source code	Where source code was missing, functional understanding was rebuilt with subject matter experts so that forward-engineered artifacts could be generated from the documented requirements.
Data readiness and discovery	Secured complete schema, anonymized datasets, agreed data transmission standards and upfront EBCDIC-to-ASCII conversion to avoid downstream delays and rework.
Dependency mapping and resolution	Reduced execution risk by automating and doing a complete inventory of applications, copybooks and control structures.
Business Rules Extraction (BRE) and test generation	Captured end-to-end business flows during BRE and consolidated rules to business level to lift test coverage and quality, while reducing human-in-the-loop effort.
Business experience fidelity for screen modernization	Error-message and screen-loading behavior was documented early, supported by a complete set of screenshots upfront, so that field-level requirements could be identified accurately.

A repeatable modernization playbook for forward-looking organizations

AI-led modernization scales when teams treat it as a repeatable playbook. The technical workflow starts by proving value on representative workloads, confirming functional equivalence early and then scaling delivery in waves with human-in-the-loop (HITL) oversight built in throughout.

With structured gates in place, agents accelerate requirement interpretation, business-rule extraction, design documentation, code conversion, test creation and validation evidence. Whether surfacing undocumented legacy logic, streamlining outdated workflows, untangling complex integrations or kick-

starting automation, agentic AI reliably speeds up modernization.

Productivity gains come from compressing repetitive analysis, managing the dead code registry, drafting and validation preparation, while keeping humans accountable for scope, exceptions, quality and final decisions.

The modernization playbook, found in the next section, outlines prescriptive steps to implement an AI-led modernization initiative.

Modernization playbook

AI acceleration with human control

DO

Use AI to speed analysis, design, transformation and validation, while keeping human review accountable for scope, quality and decisions.

DON'T

Let AI own quality, scope or sign-off decisions.

Readiness drives productivity

DO

Resolve scope, source files, access, dependencies, schemas and sample data upfront to reduce reruns and improve output quality.

DON'T

Let AI own quality, scope or final decisions.

Business continuity

DO

Preserve legacy behavior through validated business rules, end-to-end flows, screen evidence and acceptance criteria.

DON'T

Accept functional drift because the code compiles.

Cost and model discipline

DO

Track token usage, reruns and model fit by task so teams can control cost and use the right model for the right work.

DON'T

Use one premium model for every task.

Modernization playbook

Validation and governance

DO

Use intake standards, approval gates, reusable assets and dashboards to turn pilots into repeatable delivery capability.

DON'T

Treat a successful pilot as proof of factory readiness.

Data precision

DO

Check character lengths, decimal precision and scale early to prevent truncation and numeric mismatch.

DON'T

Defer data-precision checks to the dual-run stage.

Combine eval methods

DO

Use an explicit rubric with scored criteria, deterministic checks for correctness, schema, & security; use LLM judges for semantic quality; retain human gates for material risk.

DON'T

Rely on models to judge their own output; trust a single run or aggregate scoring.

Partner with an expert

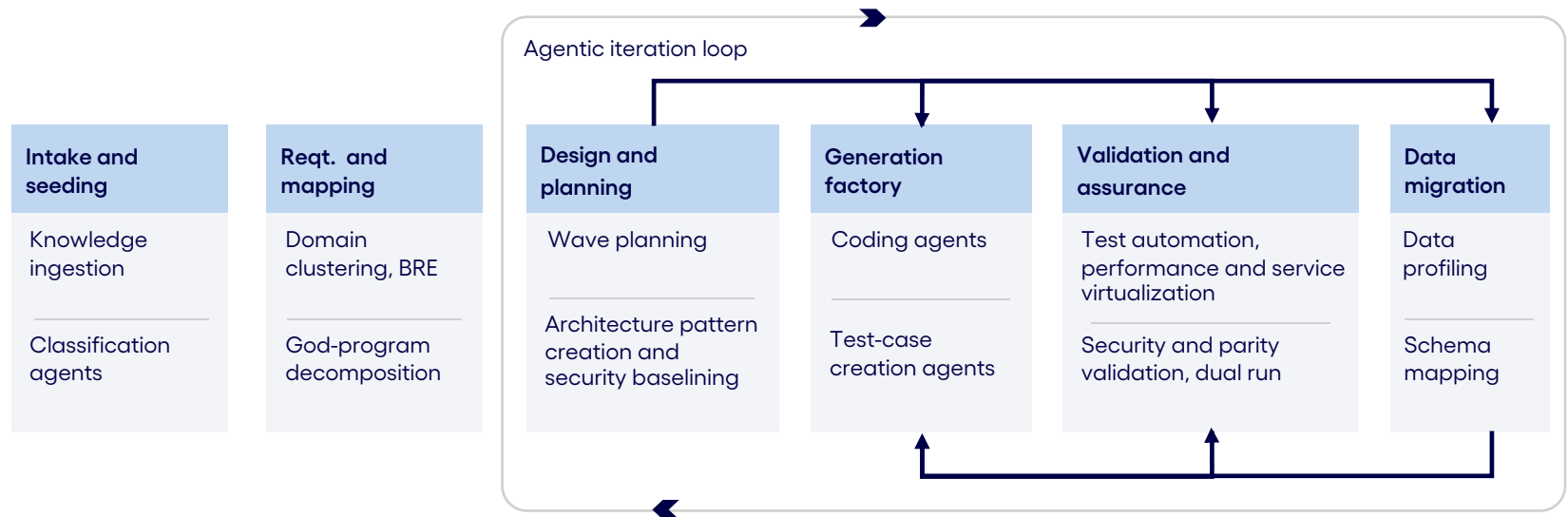
DO

Work with a partner with proven modernization and industry expertise. Look for modernization accelerators.

DON'T

Attempt modernization with an inexperienced partner.

Cognizant® Application Modernizer



Every stage is executed by AI agents under human approval gates.

Continuous feedback: validation findings re-enter design and generation

Cognizant® Application Modernizer is the enabler behind this transformation. Supporting all frontier models, the accelerator spans a six-phase, agent-orchestrated lifecycle: estate discovery, wave planning, architecture selection, code generation, quality engineering, data migration, non-functional modernization (performance, security, scalability, and resilience), dual run and cutover readiness. AI enhances insight; deterministic systems ensure predictable outcomes and functional equivalence.

Through our partnership with IBM and participation in its Blue Diamond program, our clients benefit from the mainframe-as-a-service (MFaaS) model. The consumption-based approach helps to lower fixed infrastructure costs and increase structural savings. This is a self-funding modernization cycle, where savings from each stage are reinvested into the next, creating a self-reinforcing loop of ROI improvement and continuous modernization.

How the Cognizant® Application Modernizer works

AI-led approach

The Cognizant® Application Modernizer modernizes in controlled waves and continuously validates cloud-native code against legacy behavior.

Cognizant has strategic alliances with Anthropic, Gemini and OpenAI to develop frontier AI capabilities, reusable agents and AI-driven modernization accelerators, that help clients transform legacy systems faster and at scale.

The solution for the telco combines Amazon Bedrock AgentCore, AWS Transform and Cognizant® Application Modernizer into a model designed to reduce risk, compress timelines and preserve functional equivalence throughout transformation.

How the Cognizant[®] Application Modernizer works

Governance and security

To operate responsibly at enterprise scale, Cognizant Application Modernizer embeds AI governance, security and observability throughout the modernization lifecycle. Built-in guardrails mitigate risks such as prompt injection, sensitive data exposure, unsafe outputs and unauthorized changes, while continuous monitoring and automated alerts improve operational visibility.

Business-rule traceability, AI-based quality evals and human approval gates ensure security, compliance and accountability. When a phase completes, the platform automatically generates a gate report summarizing the AI agent's findings, including critical issues, advisories and security flags.

How the Cognizant® Application Modernizer works

Outcome oriented

AI-led modernization can change the economics of mainframe transformation. By applying Cognizant Application Modernizer, telecom operators can accelerate delivery timelines, optimize program costs, reduce dependency on scarce mainframe expertise and improve the efficiency of functional integration, parallel-run and regression testing.

The business impact extends well beyond migration efficiency. By targeting complete MIPS (Million instructions per second) elimination rather than incremental optimization, organizations can unlock substantial infrastructure savings, simplify operating models, reduce technical debt and improve long-term agility. Equally important, the factory model creates a reusable modernization capability that can

be applied across successive application waves — turning a one-time transformation initiative into a scalable enterprise modernization engine that delivers a sustained return on investment.

Across industries, our clients have realized measurable results:

- Over 50% reduction in modernization effort
- 40% faster time to market for new capabilities
- Multimillion-dollar run-cost savings

Agent-orchestrated, human-governed

Where to start

1. Start with a pilot that tests workload archetypes against the hardest parts of the estate in sprints, not months
2. Sequence the remaining estate in governed waves, rather than a single big modernization push
3. Target full MIPS elimination. Partial exits leave operators paying for two environments.

For the telecom industry, the path forward is agent-orchestrated with humans in the loop, as shown in our playbook. Organizations achieve the best results when AI is used to accelerate analysis, design, transformation and validation, while humans retain accountability for critical decisions, quality assurance and business outcomes.

This is what AI-led modernization looks like in practice.

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Learn more about
AI-led application modernization at
cognizant.com/us/en/services/digital-engineering



Cognizant (Nasdaq: CTSH) is an AI Builder and technology services provider, bridging the gap between AI investment and enterprise value by building full-stack AI solutions for our clients. Our deep industry, process and engineering expertise enables us to build an organization's unique context into technology systems that amplify human potential, drive tangible outcomes and keep global enterprises ahead in a fast-changing world. See how at cognizant.ai or @cognizant.

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