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Elevating excellence: Integrating generative AI into CMMI for improved efficiency, quality and performance

Discover how integrating gen AI across the CMMI framework can revolutionize development processes, with real-world examples of Cognizant's implementation

Abstract

The Capability Maturity Model Integration (CMMI) framework is the industry benchmark for delivery quality pertaining to software, product, and service development. Gen AI provides organizations with opportunities to strengthen the industrialized deployment of the CMMI model. Cognizant is harnessing the power of gen AI to strengthen the deployment of CMMI by infusing gen AI capability across the various CMMI practices that underpin the software and services lifecycle. This paper explains our approach and presents a bird's-eye view of sixteen gen AI assistants that are in various stages of production. Cognizant posits that, "In today's highly competitive market, CMMI is a baseline requirement, companies should now consider how they can elevate their use of the CMMI model through emerging and advanced technologies like gen AI".

For more than three decades, the **Capability Maturity Model Integration (CMMI)** framework has been a benchmark of excellence, enabling companies to assess, develop and enhance key capabilities and improve performance across software, product and service development.

Whilst today, CMMI remains highly relevant as a development and benchmarking tool, the complexities of the global market and its rapid evolution require companies to adapt not only how they operate, but how they use the model itself.

This begs the question: How can we get more value from CMMI implementation?

The answer lies in infusing technology to make it more impactful, relevant, deep and meaningful.

At Cognizant, to implement CMMI protocols more efficiently and effectively, we see tremendous potential in leveraging emerging technologies—especially generative AI.

For example, through the use of gen AI, teams can leverage the vast historical knowledge of the enterprise, speeding up the development of protocols through automation, making it easier to monitor and control project progress, and supercharging creative development. The use of this technology, in conjunction with the CMMI framework, will enable companies to reduce people dependency and enhance the impact of outcomes simultaneously.

In this paper, we outline how our company is at the forefront of this intelligent journey, developing and integrating gen AI-powered assistants, tools, and accelerators in almost every capability area of the CMMI model to streamline workflows, accelerate timelines, and drive more reliability into the products and services that we deliver for our clients.

We hope you enjoy exploring how generative AI can be used to strengthen the deployment of the CMMI model and how Cognizant is applying its digital expertise in clear and tangible ways throughout the software, product and service development lifecycle. More importantly, we hope you are inspired by the power of this approach as we show how it can push the boundaries of excellence in CMMI deployment, today and in the decades to come.

"Generative AI could be society's new equalizer and a route to prosperity for all, adding as much as $1 trillion to US gross domestic product and boosting worker productivity by 10% by 2032."

Ravi Kumar S., CEO, Cognizant

As is widely known, gen AI can augment in:

- Analyzing and understanding data sources and training data, making accurate decisions at speed
- Seamlessly generating realistic images and text—including written content to a pre-defined length and style and manipulating existing text to improve its tone or professionalism
- Answering user questions through informative and engaging interactions with chatbots
- Summarizing existing written content, from articles and web pages to emails and conversation transcripts, to make it more digestible
- Classifying content based on various criteria to enhance organization and user experience
- Generating, translating, and verifying code to a high quality

What is Capability Maturity Model Integration (CMMI)?

Capability Maturity Model Integration (CMMI) is a process and behavioral model that helps organizations develop and deploy efficient and effective processes and decrease risk in software, product and service development.

CMMI is based on the Capability Maturity Model (CMM) developed in 1987 by the Software Engineering Institute at Carnegie Mellon University, in collaboration with the US government and the Department of Defense (DoD). Originally created as a tool for awarding contracts to vendor partners, CMMI provides a detailed framework outlining the expectations for organizational and project practices that need to be adopted to achieve various levels of maturity.

The CMMI model is currently administered by the CMMI Institute, which was acquired by the Information Systems Audit and Control Association (ISACA) in 2016. With the release of Version 3.0 in April 2023, the model has been expanded to include best practices for measuring capability and improving performance in areas such as people management, data management and virtual work. These enhancements increase the flexibility and applicability of CMMI across various industries and organizational contexts.

Since December 2000, Cognizant has secured CMMI Maturity Level 5, the highest on the CMMI scale. The company was reassessed against CMMI Version 2.0 at Maturity Level 5 in December 2022 for the Development and Services domains.

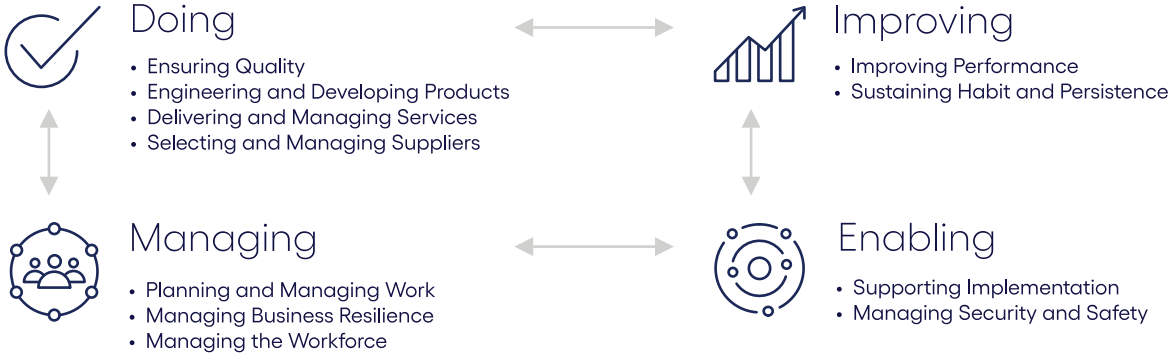
Implementing the necessary controls for developing effective and responsible gen AI solutions

When introducing gen AI solutions to strengthen CMMI V3.0 deployment, it is critical to ensure that they are developed ethically, securely and responsibly. Cognizant's Responsible AI framework is built on six robust AI guiding principles to ensure ethical, secure and transparent use of this technology. The following responsible AI principles guide all AI solutions built or deployed by Cognizant:

- Fair and inclusive
- Safe, secure and privacy-enhanced
- Transparent and explainable
- Accountable
- Governance
- Technology-resilient, robust and reliable

Cognizant has also implemented a federated, standards-driven and transparent governance model to oversee the deployment of responsible AI principles across the organization.

CMMI V3.0 capability and practice areas and interaction points



	Capability Areas	Practice Areas	
Doing	Ensuring Quality	Requirements Development & Management	Verification and Validation
		Process Quality Assurance	Peer Review
	Engineering and Developing Products	Technical Solution	Product Integration
	Delivering and Managing Services	Service Delivery Management	Strategic Service Management
Managing	Planning and Managing Work	Estimating	Monitor and Control
		Planning	
	Managing Business Resilience	Risk and Opportunity Management	Incident Resolution and Prevention
		Continuity	
	Managing the Workforce	Organizational Training	Enabling Virtual Work
Enabling	Supporting Implementation	Causal Analysis and Resolution	Configuration Management
		Decision Analysis and Resolution	
Improving	Sustaining Habit and Persistence	Governance	Implementation Infrastructure
	Improving Performance	Process Management	Managing Performance and Measurement
		Process Asset Development	

Reference: CMMI002V4 © 2021 ISACA

Harnessing the power of gen AI to enhance the implementation of CMMI practices

In this section, we outline each of the key practice areas of CMMI and demonstrate how generative AI can enhance or improve the deployment of these practices. Additionally, we highlight the specific accelerators, assistants and tools Cognizant is developing to achieve those improvements and how they drive value realization within each capability.

Ensuring Quality (ENQ) ISACA CMMI V3.0 (Domain: Development and Services)

Requirements Development and Management (RDM)

Verification and Validation (VV)

Process Quality Assurance (PQA)

Peer Review (PR)

The Ensuring Quality capability area emphasizes best-in-class delivery quality through and complete and accurate requirements elicitation, effective requirements management, incisive peer reviews, and robust verification and validation activities through independent assessments.

Gen AI can augment the work done by the project team in the Ensuring Quality capability area. Some examples of how the technology can be used include:

- Reducing the project team's effort in requirement development activities, including eliciting requirements, establishing traceability and change management
- Generating a catalog of features, epics and user stories aligned to the technology domain and scenario while establishing a traceability framework
- Enabling early identification of incomplete and incorrect requirements at the requirements stage, leading to a "First Time Right" rollout and enabling lower development costs
- Supporting testing activity, including generating test cases based on the user story catalog, creating credible test data and generating test summary reports
- Supporting technical architects and designers by conducting basic checks on the architecture design and code developed
- Managing quality assurance activities ranging from developing a quality assurance approach for a project to conducting independent preliminary assessments

Cognizant is in the process of developing two gen AI assistants to support companies during the Ensuring Quality phase:

Requirement Elicitor [1]	The Requirement Elicitor will complement the team by creating a set of preliminary features, epics and user stories aligned with the problem statement being addressed in the industry domain. The Elicitor will be able to establish traceability of requirements to the design, code and test cases, as well as between requirements. The Elicitor will also generate test cases for the finalized user stories.
Virtual Assessment Assistant [2]	The Virtual Assessment Assistant will conduct a preliminary project assessment by analyzing the reports related to process tailoring and adherence, metrics, tools usage, perceived risks and mitigation status, summarize gaps in the implementation, and suggest remedial actions.

1 – Use case conceptualization 2 – Solution under development 3 – Solution is live for use

Note: Cognizant's cross-functional teams have been working together to conceptualize, develop, and deploy the gen AI solutions listed in this document. Core owners are SMEs from our Global Delivery Excellence team, Cognizant OneIT, Cognizant Responsible AI team, Cognizant Artificial Intelligence and Analytics practice, Corporate Security, Legal and Data Privacy teams.

Planning and Managing Work (PMW) ISACA CMMI V3.0 (Domain: Development and Services)

Estimating (EST) Planning (PLAN) Monitor and Control (MC)

The Planning and Managing Work capability area focuses on estimating the size, effort, duration and cost of work and resources needed to deliver the solution. It emphasizes effective planning, monitoring, and adaptive management to ensure successful project execution and continuous improvement.

Gen AI can supplement the organization's effort (Project Managers) effort within the Planning and Managing Work capability area by streamlining project initiation, estimation, execution and governance. Some examples include:

- Enabling project teams to identify applicable processes during project initiation, tailoring the processes for the project needs, and choosing the right metrics and targets for monitoring performance based on obligations
- Suggesting the correct set of engineering tools and accelerators to aid the project in improving productivity and quality
- Estimating the project size and effort through productivity benchmarks and learnings from past experiences
- Enabling better monitoring and control of projects by generating project health status reports that identify risks and course corrections based on lessons learned

Cognizant has initiated work on three gen AI assistants within the PMW capability area:

Methods Assistant [2]	Methods Assistant will assist the project manager in identifying and tailoring the correct set of processes, as well as choosing suitable metrics, benchmarks, tools and accelerators aligned to the archetype of work and commitments made in the SOW.
Estimation Assistant [1]	Estimation Assistant will assist the project manager in making accurate estimations of project size and effort by providing suitable templates, appropriate benchmarks and learnings from past experiences.
Project Health Inspector and Remediator [1]	Project Health Inspector and Remediator can generate accurate and precise project health status reports to identify hot spots for the team to act upon and provide remedial actions based on what has been learnt from past experiences.

1 – Use case conceptualization 2 – Solution under development 3 – Solution is live for use

Engineering and Developing Products (EDP)

ISACA CMMI V3.0 (Domain: Development and Services)

Technical Solution (TS) Product Integration (PI)

The Engineering and Developing Products capability area strengthens an organization's capability to design, build, integrate and deliver practical solutions that address the client's functionality, performance and quality requirements.

Gen AI solutions can help the project team develop a product that is aligned with the specific requirements. This technology can automate or streamline many key tasks, including:

- Recommending the most appropriate architecture
- Identifying a suitable set of engineering tools or accelerators
- Generating code
- Performing code reviews
- Developing a high-level product integration strategy and
- Drafting user manuals and end-user training materials

Cognizant has deployed two gen AI assistants to support companies during the Engineering and Development phase:

Flowsource [3]	Flowsource minimizes complexity, obstacles and distractions, providing engineers with everything they need to build products. It integrates best-of-breed processes and tools to accelerate programs. This platform can also perform code scanning on code check-in, including test automation and security scanning. It supports all major code companions.
Knowledge Assistant [3]	Knowledge Assistant is designed to help the development and services team find accurate and contextual guidance on architectural patterns, technical solutions and coding guidelines. This gen AI solution will also connect development teams with technical SMEs, allow them to utilize their services for technical reviews, and facilitate talent crowdsourcing.

1 – Use case conceptualization 2 – Solution under development 3 – Solution is live for use

Gen AI Knowledge Assistant

Designed to leverage the power of enterprise knowledge base and serve contextual information

	Pursuit Teams	Engagement Lead	Project Manager	Developer
Typical user needs	Points of view, thought leadership for customer conversations	Risks and mitigations from past experiences	Case studies, best practices and accelerators for reuse	Utilities, tools, bots, and components to improve productivity
Typical responses	Summarized industry trends abstracted from thought leadership articles	Summary of safeguards, risks and mitigations from past experiences with reference documents	Abstracted summary of success stories and recommended best practices	List of tools and accelerators that can be reused contextual to the project need

Delivery and Managing Services (DMS)

ISACA CMMI V3.0 (Domain: Development and Services)

Service Delivery Management (SDM) Strategic Service Management (STSM)

The Delivery and Managing Services capability area targets projects involved in application and infrastructure management services. It focuses on delivering services, managing service delivery, and ensuring that organizations develop and deploy services aligned to their strategic business needs and plans.

Gen AI solutions can help service designers through the Delivery and Managing Services capability area. Some typical applications of gen AI are:

- Keeping the service catalog current by analyzing various market trends, peer performance and client feedback on the services being delivered and the changes that can be made
- Assisting in the development of necessary client-facing materials and benchmarks for launching a new service
- Strengthening service delivery management capabilities by extracting and tracking obligations
- Identifying continuous improvement and automation opportunities by analyzing service requests and providing remedial actions based on past learnings

Cognizant is developing two Gen AI assistants to support companies during the Delivery and Managing Services phase:

Obligation Extractor [2]	The Obligation Extractor can identify and extract delivery obligations from the Statement of Work (SOW), assign actions to the necessary stakeholders and provide a progress update on the adherence to the commitments.
SOW Drafter and Reviewer [1]	The SOW Drafter and Reviewer can auto-create a draft SOW, pre-filled with content from golden sample SOW templates. It leverages Cognizant Contract Lifecycle Risk Management guidelines and RFP (Request for Proposal)/BAFO (Best And Final Offer)/solution documents. This tool can also identify problems and hotspots in an SOW.

1 – Use case conceptualization 2 – Solution under development 3 – Solution is live for use

Managing Business Resilience (MBR) ISACA CMMI V3.0 (Domain: Development and Services)

Risk and Opportunity Management (RSK) | Continuity (CONT) | Incident Resolution and Prevention (IRP)

The Managing Business Resilience capability area focuses on identifying, analyzing, and managing potential risks and opportunities, resolving and preventing disruptions to sustain service delivery levels, and mitigating significant business disruptions.

Gen AI solutions can be used in the Managing Business Resilience capability area to proactively identify risks and opportunities at both the organization and engagement level and develop and enhance possible risk mitigation plans. Some examples include:

- Profiling the risks associated with an engagement, from the opportunity phase to the closure phase, by considering what has been learnt from past engagements and the actions required to mitigate the perceived risks
- Identifying risks in the solution proposed or Statement of Work (SOW) being drafted by analyzing the commitments against past learnings and the latest benchmarks

To deploy the MBR capability area effectively, Cognizant has initiated work on the following gen AI assistants:

Project Risk Profiler [3]	The Project Risk Profiler reviews the project demographics and extracts key characteristics, such as criticality to the client, value, size, commitments and obligations, skill requirements and resource pipeline, to determine the likely risks in the project. To refine the profile, it also applies learnings from the past.
Early Risk Prediction Alerts [3]	The Early Risk Predictor analyses triggers ranging from project health reports, cost baselines, resource utilization, effort submission, issues and metrics and predicts the likely risk level of a project.
Deliverability Assessment Assistant [2]	The Deliverability Assessment Assistant draws on information from past experiences, identifying perceived delivery risks in a deal and supporting teams in qualifying risk criticality during the opportunity phase.
Neuro IT Operations [3]	Neuro IT Operations provides an end-to-end platform that enables breakthrough performance in IT operations. The platform aids in full monitoring and observability, along with automated detection and resolution. It also provides real-time visibility into the status of operations.

1 – Use case conceptualization 2 – Solution under development 3 – Solution is live for use

Managing the Workforce (MWF) ISACA CMMI V3.0 (Domain: Development and Services)

Organizational Training (OT) | Enabling Virtual Work (EVW)

The objective of the Managing the Workforce capability area is to develop the skills and knowledge of personnel to perform their roles more effectively and efficiently while ensuring smooth and efficient client delivery in a virtual/hybrid work environment.

With the support of gen AI solutions, an organization can enable talent and manage its employees effectively in a hybrid working environment. Gen AI solutions can:

- Identify courses for employees by analyzing current skills, project requirements and industry trends
- Render references, case studies and study material based on the needs of the individual

Improving Performance (IMP) ISACA CMMI V3.0 (Domain: Development and Services)

Process Management (PCM) | Process Asset Development (PAD) | Managing Performance and Measurement (MPM)

The Improving Performance capability area focuses on managing the organization's performance using measurements and analysis to achieve business objectives. The capability area also focuses on developing and continuously improving processes and infrastructure to meet business objectives while making performance results visible, accessible and sustainable.

Measuring and managing the performance of the organization and its engagements can be augmented with the adoption of gen AI solutions. For example, a gen AI solution can:

- Determine measures and performance objectives based on client expectations and analyze performance against those goals
- Track performance using statistical techniques, ensuring the correct responses are deployed to maintain the required performance levels
- Establish a correlation between performance and process changes and help identify hotspots
- Provide insights into process usage patterns and tailoring, end-user feedback, assessment findings and necessary process improvements

Cognizant is developing the following Gen AI assistants to support companies during the Improving Performance capability area:

Process Assistant [2]	Process Assistant supports project teams in choosing the right processes for their projects and tailoring them to their needs. It also helps identify areas for strengthening the processes and aids in continuously improving those processes.
Benchmarking Assistant [1]	The Benchmarking Assistant can offer a benchmark for a project archetype based on project demographics like size, region, technology, methodology, accountability and maturity level. It can also compare performance with industry benchmarks and identify areas for improvement.

1 – Use case conceptualization 2 – Solution under development 3 – Solution is live for use

Supporting Implementation (SI) ISACA CMMI V3.0 (Domain: Development and Services)

Causal Analysis and Resolution (CAR)

Decision Analysis and Resolution (DAR)

Configuration Management (CM)

The Supporting Implementation capability area identifies causes for outcomes and takes action to prevent the recurrence of undesirable outcomes and/or ensure the recurrence of positive outcomes. The capability area also ensures that alternatives are analyzed during the decision-making process. It also stresses the integrity of work products using effective configuration management.

With the advent of gen AI solutions, it has become easier to identify the causes of outcomes, ensure desirable outcomes continue, and prevent undesirable outcomes. Gen AI can help organizations by:

- Analyzing service delivery performance data and identifying patterns that may be contributing to delays in service delivery or customer dissatisfaction
- Identifying correlations and causations in the data, helping organizations pinpoint the root causes of issues
- Assisting in identifying and prioritizing ideas to strengthen performance by predicting the impact of those ideas on organizational performance

Cognizant has deployed two gen AI solutions to enable the organization to enhance the Supporting Implementation capability area:

Bluebolt Assistant [3]	The Bluebolt Assistant helps Cognizant and project teams analyze the performance, possible root causes and ideas for addressing core challenges. Furthermore, it enables the deployment of practical ideas, enhances the team's skill set and reduces time to innovate.
CAPA Modeler [2]	The CAPA Modeler assists the project team in analyzing the root cause of the non-conformities identified in the assessment and in drawing up the remedial actions for deployment. This assistant will also provide remedial actions to prevent defects and issues.

1 – Use case conceptualization 2 – Solution under development 3 – Solution is live for use

Bluebolt Innovation Assistant

Designed to leverage the collective innovation potential of our associates, a first-of-its-kind at enterprise scale

Fuel innovation by synthesizing several years of enterprise expertise into usable insights, bridging problems with solutions

Guide innovation by assisting in generating and refining ideas through prompts and suggestions

Accelerate innovation by reducing lead times to innovate, thereby fast-tracking grassroot innovation

Sustaining Habit and Persistence (SHP)

ISACA CMMI V3.0 (Domain: Development and Services)

Governance (GOV) Implementation Infrastructure (II)

The Sustaining Habit and Persistence capability area focuses on creating a culture where processes become ingrained habits that are followed persistently by the organization.

Gen AI solutions can help sustain higher performance capabilities and ensure that the business objectives are met. For example, gen AI can be used to:

- Provide senior management with a view of performance against goals and identify hotspots to monitor the actions to be deployed
- Alert senior management proactively on risks and areas to deploy the required resources and provide a view of the risk status post-implementation

Assess CMMI Maturity [2]	To determine the CMMI maturity level of a project, the gen AI assistant parses the project information, such as planning and tracking, quality management, and performance and provides steps to achieve and sustain higher CMMI maturity levels.

1 – Use case conceptualization 2 – Solution under development 3 – Solution is live for use

Cognizant has initiated work on all the assistants mentioned above and has started deploying and embedding them in the lifecycle stages of projects.

Striving for process excellence in the era of gen AI

When CMMI was introduced, achieving the highest level of maturity in CMMI—ML5 (Optimizing), represented a significant strategic advantage. But in today's highly competitive market, it has become table stakes, a baseline requirement that organizations use to demonstrate their capabilities and maintain relevance in the market.

It is in this context that companies should consider how they can elevate their use of the CMMI model through emerging and advanced technologies like gen AI to strengthen the deployment of CMMI practices and unleash new possibilities across the software, product and service development lifecycle.

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   II. UAI Act: https://artificialintelligenceact.eu/

   III. ISO 42001:2023: https://www.iso.org/standard/81230.html

   IV. A link to the guidelines being adopted globally for AI systems development: Guidelines for secure AI system development (ncsc.gov.uk)

   V. Article about this recent update in the AI world: Released: AI security guidelines backed by 18 countries - Help Net Security

   VI. US Presidential Executive Order around AI: Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence | The White House

c. Cognizant's point of view from various forums

   1. Article published by Cognizant CEO in WEF: https://www.weforum.org/agenda/2024/02/generative-ai-society-equalizer/

   2. Check out the latest episode of Trusted Voices to hear Duncan Roberts and Ollie O'Donoghue discuss our landmark study on gen AI, conducted in partnership with Oxford Economics. https://cogniz.at/3uhXJZn

   3. Hear how we're ensuring transparency and accountability with AI in our latest episode of Trusted Voices with Babak Hodjat and Tahir Latif, FIP: https://cogniz.at/42dUui2

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