

Modern Software Engineering

G-Cloud 15





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1 Service Overview

Capgemini's Modern Software Engineering empowers organisations to unlock greater value with tailored solutions. Leveraging Domain Driven Design (DDD), we align architecture with business goals and apply modern practices—Continuous Integration, Continuous Delivery, and Test Driven Design (TDD) for quality, agility, and maintainability beyond typical COTS solutions

Features

- Provides expert Design assistance, including DDD
- Reviews and assesses current application architectures
- Evaluates modernisation opportunities for legacy applications
- Advises on Microservices versus Monolithic architectures
- Delivers coding services using leading open-source technologies
- Guides on implementing observability for services
- Supports Java, Scala, and other JVM language projects
- Provides comprehensive release and testing support
- Offers DevOps practices for streamlined software delivery
- Ensures security and privacy in engineering solutions

Benefits

- Improves business agility
- Enables development of flexible, component-based systems
- Helps reduce operating costs
- Supports creation of observable, maintainable systems
- Designs flexible, scalable architectures
- Advises on using coding assistants in development
- Provides guidance on ML for self-healing systems
- Accelerates time-to-market for new features
- Enhances software quality and reliability
- Strengthens security and privacy in engineering solutions

2 Business Need

In today's rapidly evolving digital landscape, businesses face unprecedented challenges in remaining competitive and meeting the ever-changing needs of their customers. Off-the-shelf software solutions often fall short of addressing the unique requirements and processes of individual organisations, hindering their ability to respond swiftly and innovate. Custom applications built using modern software practices and tailored to the distinct demands of each business environment help address this challenge.

Custom applications offer advantages over their off-the-shelf counterparts. By aligning closely with the business objectives, workflows, and user experiences, they enable organisations to streamline operations, boost efficiency, and foster innovation. Unlike COTS solutions, custom applications can be designed to integrate seamlessly with existing systems and processes, ensuring a smooth transition and minimal disruption to daily operations.

In today's data-driven world, the capacity to harness and leverage vast volumes of information is crucial for gaining a competitive edge. Custom applications empower organisations to collect, analyse, and store valuable data, supporting better decision-making and strategic planning.



Modern software practices, when combined with Agile development methodologies and DevOps/DevSecOps principles, can deliver high levels of agility and scalability, especially when integrated with Cloud Native architectures. These combined practices enable organisations to adapt and respond rapidly to changing circumstances, whether driven by user needs or external factors.

3 Our Approach

"Modern software development" includes a range of practices, methodologies, and technologies that have developed in response to the changing needs and complexities of today's digital landscape. Key features of modern software development include –

- Agile methodologies that promote iterative development and ongoing collaboration between business and technology teams.
- DevOps and DevSecOps principles, encouraging integration between development, operations, and security for faster, safer delivery.
- Cloud Native architectures that enable scalability, flexibility, and resilience in software solutions.
- Continuous Integration and Continuous Deployment (CI/CD) pipelines to automate testing and delivery processes.
- Domain Driven Design to accurately model and manage complex business environments.
- Emphasis on product-centric approaches, with teams responsible for the full product lifecycle from conception to production.
- Seamless integration with existing systems and processes, minimising disruption and maximising value.
- Data-driven approaches that empower organisations to collect, analyse, and leverage information for strategic advantage.
- Clear separation of domains and adoption of ubiquitous language to enhance team consistency and stakeholder communication.
- Focus on security and privacy throughout the engineering process, ensuring robust and compliant solutions.

3.1 Agile

Capgemini has a long-standing history and proven track record of working with agile methodologies to bridge the gap between business and technology, dating back to our adoption of the Rational Unified Process last century and including Capgemini's numerous certified Scrum Masters and practitioners currently working on Government Digital Service (GDS)-aligned cloud programmes. Capgemini can assess agile understanding and adoption across divisions and levels of the buyer organisation and provide recommendations for improvement. The company has experience with SaFE and its "Agile @ Scale" offerings, demonstrating how low-level Agile project practices connect to the broader programme landscape. Capgemini provides training and game-based examples to help change employees' mindsets across the organisation, enabling it to fully realise the benefits of being an agile technology organisation.

3.2 Products not projects

Software development is an ongoing process and cannot be easily defined by traditional project methods. Capgemini has experience with a modern product delivery approach in which the team is responsible for the entire product lifecycle and delivers solutions from conception through deployment in a production environment.

This can increase the team's ownership of the product, improving alignment between the business and the team. Multiple products enable the team to operate independently, enhancing adaptability and reliability.



3.3 Domain Driven Design

Domain-Driven Design can help organisations navigate complex domains and develop solutions that more accurately reflect the intricacies of the real-world system being modelled.

Proper modelling of domains and their boundaries enables businesses to adapt to future needs. Accurate separation allows these domains to evolve independently, reducing the “communication overhead” and letting domains (teams) progress separately.

The clear separation of contexts and the use of a standard, ubiquitous language enable teams to be more consistent internally and facilitate easier communication with other stakeholders.

3.4 Software Architecture

A robust software architecture is essential for all products; without it, products become fragile and hard to maintain. Choosing the exemplary architecture, especially the correct boundaries between modules, is vital, as poor boundaries can make systems more complex and increase coupling over time. Excessive coupling results in higher maintenance costs and accumulated technical debt. This can ultimately lead to reputational damage (such as outages) and harm business competitiveness. Capgemini provides services and advice in this area, including:

- Composable Architectures – also known as plug-and-play.
- Micro-services – when and where to use.
- Modular Monoliths.
- Event-Driven Architectures.
- Event-sourced Architectures.

Capgemini also follows the 12-factor app principles as a guideline to design more scalable and maintainable systems.

3.5 Contract First

Contract First Development is an approach to development and architecture where APIs (contracts) between systems are defined before implementation. This method offers several benefits -

- Improves communication and alignment between teams, reducing misunderstandings or misalignments during development.
- Ensures a shared understanding of requirements and expectations.
- Facilitates easier integration of components by establishing clear interfaces upfront, allowing teams to work independently once defined.
- Promotes a modular and scalable architecture.
- Simplifies the maintenance and evolution of the system over time.
- Allows for early identification and resolution of potential issues.

3.6 Engineering Practices:

Capgemini can provide advice and assistance in the following areas –

- **Test-Driven Development (TDD):** Capgemini advocates writing small, targeted tests before coding to define precise specifications. This approach encourages frequent refactoring, resulting in simpler, more maintainable solutions with high test coverage and robust code quality.
- **Trunk-Based Development:** All production changes are integrated into a single main branch, enabling rapid feature flow and reducing integration issues. This practice supports continuous delivery and minimises the risk of long-lived branches causing merge conflicts.
- **Automated Testing & Shift-Left Quality:** Every commit to the main branch undergoes a comprehensive automated test cycle, including unit, integration, and near-neighbour testing. Capgemini recommends



deploying code to ephemeral environments for early smoke testing to ensure issues are detected and resolved as soon as possible. This proactive, shift-left approach improves reliability and accelerates feedback loops.

- **Generative AI & Coding Assistants:** Capgemini provides guidance on leveraging tools like GitHub Copilot and other generative AI solutions. These tools have been shown to boost developer productivity and code quality. Capgemini can help organisations adopt and integrate these technologies effectively into their development workflows.

3.7 DevOps Practices

DevOps is about unifying development and operations to accelerate and improve software delivery. Key principles include automation, continuous integration and delivery (CI/CD), and infrastructure as code (IaC), all of which enable faster, more reliable deployments.

Continuous Integration (CI)

- Regularly build and integrate code, not just for monolithic architectures but also for microservices and distributed systems.
- Use contract testing and mocking to ensure components interact correctly, even in complex environments.
- Record requests in higher environments to enable realistic, shift-left testing.

Recommended pipeline components:

- Code quality checks
- Code coverage reports
- Vulnerability scanning
- Dependency checks
- Contract testing
- API documentation and publishing
- Unit testing
- Continuous Deployment (CD)
- Deploy to higher environments early to build developer confidence and provide business users with early visibility of changes.
- Decouple deployment from release: deploy features to production, but control their availability to users through feature management.

Deployment strategies:

- **Feature Flags:** Toggle features on or off as needed.
- **Blue/Green Deployment:** Run new and old versions side by side, switching traffic when ready.
- **A/B Testing:** Expose features to a subset of users for experimentation and acceptance testing.
- **Dark Deployments:** Deploy services early, before dependent services are live.

These strategies also enable parallel testing of current and new versions in lower environments by adjusting configurations.

3.8 Observability

Monitoring a system's health and performance is essential to its successful operation. System outages can cause significant reputational and business impact. Capgemini brings extensive experience managing large-scale, complex systems and offers expert guidance to enhance system observability. This includes implementing comprehensive logging, metrics, and alerting solutions, and leveraging machine learning algorithms to detect and diagnose issues more effectively.



3.9 DevOps Performance

Capgemini recommends using DORA metrics to assess and improve DevOps performance. Rather than treating these metrics as fixed targets, they should be used to identify trends and uncover areas that may be slowing workflow through the development lifecycle. The key DORA metrics are –

- **Deployment Frequency:** Measures how often teams deploy code to production or other environments, reflecting the pace of delivery.
- **Lead Time for Changes:** Tracks the time taken from starting work on a change to its successful deployment, highlighting process efficiency.
- **Mean Time to Failure:** Indicates the average time between failures, such as deployments, incidents, or outages, helping teams understand system stability.
- **Mean Time to Recovery:** Measures how quickly services can be restored after a failure, emphasising resilience and recovery capability.

By monitoring these metrics over time, organisations can gain valuable insights into their software delivery processes, identify bottlenecks, and drive continuous improvement.

3.10 Continuous Learning and Improvement:

Ongoing learning and improvement are essential elements of modern software development. Teams foster a culture that encourages experimentation, learns from setbacks, and regularly updating their processes and technologies to keep pace with rapid change. This philosophy is consistent with Capgemini's agile methodology.

Capgemini recommends capturing SPACE metrics—a multidimensional framework for better understanding developer productivity. The SPACE model was introduced to challenge misconceptions about productivity, making clear that a single metric can't define productivity. Collecting these metrics supports continuous improvement by informing decision-making and enhancing the overall "Developer Experience."

3.11 Open Source

Capgemini provides a full range of services to support and enhance Open Source-based Cloud solutions throughout the project lifecycle. When creating these solutions, Capgemini begins by thoroughly understanding the problem area, the desired outcomes—both functional and non-functional—and any limitations affecting the project. To identify suitable Open Source options, they apply their Open Source Maturity Model and several key criteria:

- **Product:** Assesses if the solution meets criteria like purpose, functionality, security, required features, developer activity, and stability.
- **Integration:** Reviews whether the solution supports modularity, open standards, and integration with other products or infrastructure.
- **Use:** Evaluates the ease of daily use for users and the available support resources.
- **Acceptance:** Considers community reception and the potential for ongoing growth and development.

Based on these factors, Capgemini assists clients in choosing Open Source components that align with commercial needs, cost efficiency, maturity, and reliability, while also recommending the right support models. They ensure that selected components adhere to Open Standards to prevent vendor lock-in.

Using their Open Source Maturity Model, Capgemini creates a comprehensive view of available tools, frameworks, and platforms for both software development and implementation. Their architectural approach favours building systems from discrete components, reducing dependencies and making it easier to swap out parts of the system with minimal disruption. Additionally, Capgemini places special emphasis on operational requirements, including monitoring, management, configuration, and maintenance, to ensure successful deployments.

Capgemini generally prefers Open Source wherever feasible, which allows them to:



- Support the broader Open Source community;
- Engage with the Open Source model by contributing bug fixes, enhancements, and shared knowledge when appropriate;
- Favour existing solutions before considering custom builds, utilising approaches like the GitHub fork model;
- Manage licensing, attribution, and participation in the community as needed.

3.12 Security and Privacy

Capgemini recognises that ensuring the appropriate level of security and privacy is essential to every solution. The company's methodology facilitates the early evaluation and classification of security and privacy requirements, in collaboration with the Buyer. This approach supports the integration of "secure by design" and "privacy by design" principles throughout the functional and technical aspects of solution development, the establishment and implementation of necessary delivery environments, and Capgemini's overall delivery methods and practices.

4 Buyer Responsibilities

Please refer to the Supplier Terms listed with this service on the Platform. These may contain additional Buyer obligations/costs the Buyer is subject to that are not identified anywhere else in the Supplier's Application or on the Platform.

The Buyer's responsibilities as part of this service are as follows:

- Buyer must ensure a project owner is available and empowered to make decisions when requested by the project delivery team, in a timely fashion.
- Buyer must ensure that changes to project goals are documented and communicated to the project delivery team in a timely fashion.
- Buyer should ensure that the project owner attends regular project progress meetings.

If these responsibilities do not align with the Buyer's expectations, please contact Capgemini so we can explore options to adjust the approach.

5 Service Management

Capgemini can provide individual services within each phase to support the client through the initial assessment, design, development, implementation, integration, configuration, and training, or provide a comprehensive service covering an entire cloud-focused, agile-delivered, Open Source implementation. The scope of the individual services to be provided can be determined after an initial discussion.

5.1 Planning Services

Capgemini's Planning Services deliver comprehensive support, including architecture development, domain modelling, monitoring design, and the formulation of implementation roadmaps based on thorough requirements analysis. Tools commonly employed include user research, Domain Driven Design, Event Storming, and Whirlpool Modelling.

Capgemini is equipped to perform organisational readiness assessments that identify areas where Open Source and Modern Software Engineering practices can add significant value. These assessments also help in devising strategies to mitigate risks associated with implementation.

These services assist public sector organisations in aligning with government policies regarding Cloud adoption, Open Source technologies, and GDS standards. They underpin the development of robust business cases for introducing Modern Software Engineering approaches. Specifically, Capgemini can:



- Establish repeatable processes for software development lifecycles, deployment, patch management, and incident management to support future developments,
- Facilitate the adoption of Modern Software Engineering methodologies,
- Identify and deliver targeted training plans to enhance operational readiness, and
- Support the internal and community-wide sharing of developed solutions, including managing contributions and licensing considerations.

5.2 Setup and Migration Services

Capgemini offers automated, repeatable Infrastructure as Code solutions for both cloud and on-premises environments, including the setup of build pipelines to manage ongoing changes. Their expertise includes tools such as Terraform, Ansible, Packer, and Puppet for non-cloud-native systems, as well as Docker and Kubernetes for building application platforms that can be migrated. Capgemini also has extensive experience with migrations across multiple cloud providers, offering consulting services and direct project support to share its expertise.

5.3 Quality Assurance and Performance Testing Services

Capgemini's Quality Assurance and Performance Testing Services offer architecture, configuration, and code reviews, as well as analysis of application instrumentation and monitoring implementation. These services also include performance tuning for applications developed with this technology. In addition, Capgemini provides support in service management and reporting, integration, release, and testing.

5.4 Training Services

Capgemini can provide both classroom- and Internet-based learning for product-based knowledge transfer. Capgemini can also support a team enablement model through pairing (a buddy system for development/support) or team-based knowledge transfer to promote a hands-on learning approach. This may be a more effective learning method than product-based learning, which Capgemini can tailor more to the agreed Buyer's needs. Training may include the supply of equipment at an additional cost, as decided in the Order Form; if not requested, attendees are expected to bring their own equipment.

5.5 Support Services

Capgemini's Support Services can provide analysis of application instrumentation and monitoring implementation, improvement or remediation and support for existing applications built using this technology. Capgemini's Support Services can provide related support, including service management and reporting, integration, release, and testing support.

5.6 Rightshore®

Where required, Capgemini can provide experienced consultants from our overseas delivery centres at reduced rates. Please refer to individual SFIA Rate Cards for more information.

6 Protection of Data

This service is classified as 'Official'. However, if you require a different security classification, please get in touch with us to discuss.



7 On-boarding and Off-boarding

Capgemini shall undertake on-boarding and off-boarding activities agreed within the Order Form (including as a minimum an exit plan in line with the Call-Off Contract terms) which will be charged for in accordance with the Pricing section for this service.

8 Skills and Knowledge Transfer

Capgemini recognises that skills and knowledge transfer is a critical element in the provision of G-Cloud services to public sector clients. Where possible and applicable, this forms part of the delivery plan for the service agreed at the start of the engagement. Our consultants and engineers are experienced in providing skills and knowledge transfer for major private and public sector clients.

Where appropriate, we may use a standard approach, tailored to topic, skills-gap and individual, to ensure consistency and effectiveness. The approach, Capgemini's Assess-Plan-Implement framework, has been used repeatedly by our teams to structure the work involved in transferring skills and creating new teams capable of driving and sustaining change long after the end of the formal programme. The framework can be applied throughout a project to understand knowledge transfer objectives, plan training delivery methods and materials, and deliver and evaluate success.

9 Vendor Accreditations/Awards



For the 13th year in a row, Capgemini has been recognised as one of the World's Most Ethical Companies® by the Ethisphere® Institute. This is an acknowledgment of our ethical culture that makes us an employer of choice and responsible player in the eyes of our clients, shareholders, and the wider community.

10 Sub-contractors

Capgemini UK may use the following subcontractors to deliver this service:

- Capgemini Technology Services India Limited.

11 Business Continuity and Disaster Recovery

No disaster recovery plan is provided as part of these Services.

12 Pricing

This service is priced in accordance with the SFIA Rate Card attached. Capgemini can also provide offshore resources at reduced rates where appropriate. Projects can be priced either on a Time & Materials or Fixed Price basis.

13 Ordering and Invoicing

Please refer to the Supplier Terms for this service.



We would be pleased to arrange a call or meeting to discuss your requirements of our service in more detail.

14 Termination Terms

Please refer to the Supplier Terms for this service.

15 Further Information

For more information about this or any of our G-Cloud services, please contact our Public Sector Team.

Phone: 0370 904 4858

Email: publicsector.opps.uk@capgemini.com including the following information:

1. The name of this service.
2. The name of your organisation.
3. Your name and contact details.
4. A brief description of your business situation.
5. Your preferred timescales for starting the work.

About Capgemini

Capgemini is a global business and technology transformation partner, helping organizations to accelerate their dual transition to a digital and sustainable world, while creating tangible impact for enterprises and society. It is a responsible and diverse group of 340,000 team members in more than 50 countries. With its strong over 55-year heritage, Capgemini is trusted by its clients to unlock the value of technology to address the entire breadth of their business needs. It delivers end-to-end services and solutions leveraging strengths from strategy and design to engineering, all fueled by its market leading capabilities in AI, generative AI, cloud and data, combined with its deep industry expertise and partner ecosystem. The Group reported 2024 global revenues of €22.1 billion.

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