Capgemini

The digital CIO's handbook

Making digital business a reality through cloud and application technologies

Table of contents

INTRODUCTION

A global beverage company disrupts the industry with an engaging touchscreen dispenser, creating a unique customer experience and providing valuable insight into customer preferences. A wireless carrier builds an agile promotions-management platform to provide Netflix free for new subscribers. A global restaurant chain uses IoT sensors on its beer taps to boost revenue thanks to an in-depth understanding of customer preferences.

This is what digital business looks like. Across every industry, digital is disrupting the way companies operate, creating new leaders and leaving industry giants and niche players struggling to adapt. From banking to travel to entertainment to government, digital is changing the way we live and do business.

Shifting to a digital business means becoming more agile, leveraging the power of emerging technologies, and creating new business models. It means harnessing the power of cloud and application technologies to modernize and operate more efficiently, deliver compelling customer experiences, and launch innovative new services ahead of the pack – to scale and grow with ease.

From migration to microservices, automation to containerization, and integration to DevOps, application and cloud technologies are the key to making digital business a reality. Freed from a focus on basic IT infrastructure and fueled by new tools for analysis, insight, and intelligent applications, creative energies can focus on imagining and bringing to life new ways of doing business ahead of the competition: new sources of growth, new business channels, new customer insights, and new ways to delight customers.

Despite the benefits, many companies struggle to shift to digital business models, beholden to legacy systems and governance models that just can't keep up with the pace of innovation.

It's imperative that digital laggards catch up – and fast – as organizations everywhere change their business models. But transforming to a digital business requires a holistic approach, bringing together not just technology but also people and processes.

We believe there are three keys to successfully operating as a digital business by leveraging cloud and application technologies:

- **Make infrastructure invisible**
- **Deliver apps at the pace of innovation**
- **Embrace Monday's idea as Friday's reality.**

But how can you get there? And what does success look like? In the following pages, we share some of Capgemini's latest insights and perspectives on how to accomplish these objectives and make digital business a reality.

Application and cloud technologies are the key to making digital business a reality

Making infrastructure invisible

Shift from managing infrastructure to driving growth

Think of the experience of using an Apple TV for the first time. You remove the device from its packaging, connect it to your TV, enter your password, and – just like that – you're up and running. No lengthy set-up, no complicated processes, no user's manual. It just works.

This is what we mean by making infrastructure invisible, one of the keys to becoming a digital business. When you harness the power of the cloud, you don't need to worry about where things run; they just run. You don't need to worry about scaling for fluctuations in demand; they just scale. You don't need to handle manual processes; they're handled automatically.

Freed from the need to focus on basic infrastructure with long procurement cycles and fueled by next-generation capabilities and tools, you're able to imagine and act on new ways of doing business, ahead of the competition. And because of reductions in run cost and improvements in operational excellence, you have more funds to invest in value-added activities and digital-transformation initiatives.

Making infrastructure invisible is about migrating to the cloud, automating processes, and exploiting the power of orchestration tools like managed Kubernetes. From where your applications live to how they're managed, it's about laying the groundwork to transform to digital. In the following pages, we'll share what it takes to make it happen and jumpstart your journey to digital business.

It's about laying the groundwork to transform to digital.

Building the business case and roadmap for digital transformation

In the digital era, CIOs of large enterprises face a fundamental dilemma: they must both perform – increase operational excellence, reduce costs, and make existing systems faster – and transform – move the company to digital business models, enhance the customer experience, enable always-on innovation, and become more agile. Making the shift from IT that just drives down costs to IT that also drives business value is what separates the leaders from the laggards in the digital world.

But bridging the digital divide to perform and transform at the same time can be a challenge for many organizations, particularly those with large legacy estates. So how do they get to a place where they can do both? It all starts with a solid plan.

These are the fundamental components of a well-founded plan for both performing and transforming in a digital era:

Decision framework. A decision framework includes the organizational strategy, vision, and guiding principles to drive the decision-making process and provide parameters for how IT will engage with the business. For example, as an organization shifts towards agile and decides whether to be product-driven or services-driven, a decision framework will lay out the implications of the selected choice.

Assessment. An assessment provides an in-depth understanding of the current state and forms the basis for a business case and roadmap. An assessment should include analyses across multiple dimensions, including application portfolio, infrastructure, costs, cloud and digital readiness, and resource allocation. It looks across domains and business processes to identify what to eliminate, consolidate, modernize, replace, or remove, as well as where to invest in the future.

Execution roadmap. An execution roadmap prioritizes initiatives like application modernization, cloud, automation, DevOps, and RPA by considering timelines, costs, and findings of the assessment phase.

Business case. The business case includes the financial rationale behind a transformation, including expected cost to achieve, savings, and returns. It provides a forecast for return on investment and connects IT changes to business KPIs that ensure ongoing project funding.

Change-management strategy. A change-management strategy plans for the organizational shifts needed to support technological change. It should include a target operating model that includes the make-up of the new organization, required skills, and roles and responsibilities.

Because various components are required to create a well-structured plan, the strategy phase is critical to any transformation program. This will include a combination of workshops, interviews, assessments, analyses, and meetings to gain alignment across the organization. By aligning principles, understanding the IT enterprise from bottom-up, and building an initiative roadmap, the organization is able to manage and track transformation at an intentional program level to drive efficiency.

As you're building the plan, there are a few important factors to keep in mind. First, develop a current-state cost model. Many IT organizations don't have visibility into how much their applications cost per year but, before embarking on a major transformation initiative, it's imperative to understand the cost per year in order to be able to show return on investment later on down the line. It's also critical to have a sense of the future-state hardware and software costs based on the solution proposed. To accompany this, you should also understand forecasted revenue bumps as a result of these transformative changes across both business and IT dimensions. This will help build the case for short-term and long-term investment.

It's also important that IT organizations not overlook the organizational aspects of change. IT transformation projects aren't just about technology; they're also about people, processes, and culture. IT leaders need to think about the skill sets they need and how existing skills are going to change to support the future. You'll need a plan for upskilling existing teams as well as recruiting for hard-to-find skills.

Ensure maximum benefit from the cloud with a center of excellence

The cloud offers innumerable advantages, including improved agility, faster development cycles, reduced cost, and better automation. But these benefits are not realized by just embracing the cloud. To truly capitalize on the agility and value it can provide, organizations need to adopt a new operating and development paradigm, and that requires a change in culture, people, and processes.

Establishing a cloud center of excellence (CoE) is one of the best ways to ensure that the move is as seamless and beneficial as possible. From establishing the right processes to helping a team make decisions, a cloud CoE provides the structure and approach required for success across both business and technical dimensions.

A cloud CoE helps an organization benefit from "invisible infrastructure" in the following ways:

1 **Drives strong alignment between IT and the business**

In a cloud-based model, IT is able to move with greater agility to serve the needs of the business. To do so, it needs to be much more closely connected than ever before. A cloud CoE facilitates strong alignment between IT and the business and helps measure the business impact of cloud-based initiatives.

2 **Establishes an effective governance model**

IT organizations need to put the processes in place to successfully manage the transition to a cloud way of working and a cloud-first mindset. From portfolio management to measurement, a cloud center of excellence establishes the methodologies and oversight structure required.

3 **Ensures team readiness**

Moving to the cloud requires a shift in both what the IT team works on and how it works. A cloud center of excellence establishes the roles that are needed to support cloud transformation and builds and executes on a change-management plan to transform the organization to support a cloud-first way of working. It covers resourcing, training, and development.

4 **Determines the right architecture to enable change**

When optimizing the move to the cloud, having the right architecture across infrastructure, applications, services, and components is critical. A reference architecture managed by the cloud CoE ensures that teams have the right templates as well as the right vocabulary for systems and solutions architectures, provisioning, and application development.

5 **Provides operational oversight**

A cloud CoE ensures that the run and operations of IT workloads in the cloud are as smooth and effective as possible. It defines not just current operating procedures but also the changes that need to take place for successful cloud adoption. It includes monitoring, inventory management, reporting, and disaster recovery, among others.

6 **Establishes security controls**

A cloud CoE supports the shift from self-managed to cloud-based security. It provides the structure to implement and plan security initiatives including data protection and identity and access management.

To start building a cloud CoE, strong executive support and vision are required to enable organization change. Bringing in experienced SMEs also helps guide and support the existing team during the transition. Once established, the structure and focus will continue to change as you move from the initial cloud adoption phase to one more focused on cloud-native and transformation initiatives.

CASE STUDY

Bringing bottlers into the digital age at Coke One North America (CONA)

The challenge

Coke One North America (CONA) serves the 12 largest North American Coca-Cola bottlers with tools they need to collaborate as one company. CONA Services set out to find the ideal digital and cloud foundation for its SAP HANA-based IT platform.

Our approach

Working closely with SAP and Microsoft, Capgemini planned and managed a massive and highly complex migration of nine landscapes, five of them physical, to Microsoft Azure, including disaster recovery with multi-tier SAP HANA system replication, a production SAP Business Warehouse on SAP HANA, a database of more than 12 terabytes, and 40 Azure Virtual Machines — in just seven months.

Results

Completing the monumental migration, CONA is more agile and is leveraging machine learning and analytics. It has also seen immediate cost value, higher reliability, lower latency, and improved security. The platform handles roughly 160,000 orders a day, representing an annual $21 billion in net sales value, improving operations to thrive in the digital age of bottling.

Accelerating legacy IT with automation

Adapted from *The automation advantage*, a Capgemini report

Enterprises are seizing on cloud-native applications and DevOps to develop software continuously, and leaders are using this agility to achieve first-mover advantage. To remain competitive, established enterprises can use cloud technologies to automate their legacy applications and IT operations processes. Automation is a lever for acceleration in all areas of software development – both on premises and in the cloud.

Public cloud and PaaS platforms offer built-in tools that automate tasks like infrastructure provisioning, configuration management, application testing, and application release, but legacy systems do not. The automation of legacy technologies and processes therefore becomes essential to keep pace with the cloud, so that new software or features can move from development to production in minutes, even on traditional applications.

Here are the four key factors to keep in mind to ensure that automation benefits your business:

Define the automation strategy to meet objectives

Define KPIs for speed and agility, and develop your automation strategy to align to them. The benefits to be gained from automation depend on the business use of each application. Rapidly changing applications that provide differentiating business capabilities will benefit most from being rewritten as cloud-native services. Non-differentiating applications that still need to evolve quickly should be considered for refactoring, while other non-differentiating applications should be replaced with SaaS, or simply rehosted. When evaluating applications, consider both their technical architecture and their value and criticality to the business.

Leverage Platform-as-a-Service for automation and acceleration

Platform as a Service (PaaS) is an enabler of cloud-native development, but the automation capabilities of PaaS can also accelerate traditional applications. PaaS improves time to market by facilitating continuous integration and delivery. It allows developers to move from concept to code in minutes and use instant self-service provisioning. It also reduces the cycle time of operations through automated failure response, self-healing, and recovery, while the platform can be upgraded independently of the applications it supports, without downtime. Additionally, it improves productivity by eliminating undifferentiated heavy lifting, and confers push-button control of the entire application stack, so that IT teams can manage services, not servers.

Automate the provisioning of infrastructure and the entire CI/CD pipeline

CI/CD (continuous integration/continuous delivery) does not apply only to container-based microservices. The core tenets, including versioning, build, and testing, apply to both modern and legacy applications. However, legacy applications – where code base changes tend to have more dependencies and a larger blast radius – can pose greater automation challenges. The IT industry today lacks a single automation tool that can flexibly abstract, natively integrate, and seamlessly support a wide range of both cloud and legacy services. Because existing automation investments, vendor relationships, and technology footprints can inhibit the adoption of new CI/CD automation tools, enterprises will need to use multiple tools.

Build the governance model, processes, and culture for DevOps

Automated provisioning and application release automation are critical enablers of enterprise DevOps, but DevOps is more than a technology movement. It is a holistic culture and practice that demands a governance model, skills, and ways of working that differ radically from those associated with waterfall development. IT leaders need to drive behavioral and cultural changes to achieve a DevOps culture. It is important for the team to embrace baseline DevOps best practices irrespective of the underlying toolset or technologies. Tools and technologies can then help automate and standardize.

In following these principles, organizations will lay the foundation to accelerate delivery and improve competitiveness with enterprise DevOps.

Cloud migration for digital transformation: maximizing the benefits

Adapted from *The automation advantage*, a Capgemini report

As organizations continue to adopt cloud at a record pace, it's important to keep in mind that though there are benefits to migrating legacy applications via rehosting or lift-and-shift, migration is a means to an end rather than an end in itself. Organizations need to align migration plans with a broader optimization and transformation strategy. In other words, you should never migrate for the sake of migrating. Rather, each decision related to migrating to the cloud – or not – should be thought of as a critical step on a larger transformation journey.

While cloud migration can and should improve IT operational excellence and reduce run costs, the real value of cloud migration comes when you apply the gains from IT optimization towards IT transformation initiatives. Despite this, we often encounter organizations that have plans to migrate to the cloud without a clear strategy or business case. In cases like this, what should be a transformational change can quickly become a missed opportunity. Here's how to maximize the benefits of migration for digital transformation:

Be comprehensive

Even though you may not plan on migrating all your applications at once – and though there may be some you will never migrate – it's important to take a big-picture approach. A solid cloud-migration strategy considers both the applications you're planning on migrating and those that you never will. From the beginning, you should be thinking about the comprehensive business case and where the biggest wins will be over the long-term.

Apply a transformation lens

Remembering that digital transformation is your end game will help you be smart about the strategy you take. For example, you should start with those applications that would clearly benefit from the cloud, such as those that are critical for maintaining competitive advantage. Similarly, for data-center transformation, the goal should go well beyond cost-optimization to include operational and reliability efficiencies that can be achieved when deploying PaaS services.

Optimize, optimize, optimize

While comprehensiveness is important, it's critical not to mistake a holistic approach for a one-size-fits-all approach to cloud migration. While lifting-and-shifting critical applications will be part of your strategy, a pure lift-and-shift approach will never lead to the transformational outcomes you'd want from the cloud. A more transformation-led approach will focus primarily on refactoring and rearchitecting the applications that are differentiating, fast-moving, and would benefit most from the cloud and cloud-native capabilities.

Remember that speed is important

One of the biggest hurdles to overcome before moving to the cloud is the cost of the migration itself, so ensuring that you move as quickly and efficiently as possible will pay off. The faster you move, the quicker you can see transformative change within your organization. The key to success is developing a solid plan: having an in-depth understanding of your landscape, getting stakeholder buy-in early on, and planning effectively for change management.

Being deliberate and purposeful about your migration will ensure that you not only see cost savings and operational efficiencies, but you lay the groundwork for digital business.

CASE STUDY

Building a cloud core to build dream homes faster at LP Building Solutions

The challenge

LP Building Solutions, a leading building materials manufacturer, has always leveraged technology to produce materials as efficiently as possible. To ensure long-term, sustainable growth, LP wanted more from its technology: greater efficiency, more scalability, and better performance.

Our approach

We helped LP migrate from a data-center model to a cloud-based SAP environment in less than four months. The migration moved five SAP landscapes with more than 73 systems from a data center environment to the AWS Cloud without any interruption in LP's fast-paced businesses processes – and the migration was completed ahead of schedule – in just seven months.

Results

Thanks to a successful implementation, LP now loads trucks faster with fewer logistical problems, employee response time is lightning fast, and reporting now includes real-time data for fast and accurate business insights. LP has also seen a 20% improvement in application performance as well as greater scalability, 24x7 availability, and improved disaster recovery.

Why managed Kubernetes may be right for your business

Organizations everywhere are moving to containerized applications. This rapid shift to digital transformation and uptake of application-modernization approaches using cloud and microservices architectures is helping enterprises innovate and grow their businesses faster than ever. However, the modernization of the IT landscape poses significant challenges for IT organizations, from dealing with relatively new requirements associated with continuous delivery to managing distributed and granular application components and hybrid infrastructure across the build, deploy, and operate lifecycle.

Container platforms respond to modernization challenges

Container platforms are helping companies address these challenges. Containers package application components and their dependencies so they can be easily version controlled and seamlessly ported and replicated across different data-center and cloud platforms. This eases the development, testing, deployment, and overall management of applications.

Container technology is triggering significant operational change in the cloud-computing era by improving agility, increasing scalability, and optimizing resources, but the massive scale of containerization requires orchestrating the deployment, management, scalability, networking, and availability of the containers themselves. Choosing the right container orchestration layer for applications can be a challenge. Should you manage it yourself or rely on a solution offered by a PaaS provider or cloud-service provider?

Run-your-own Kubernetes versus managed Kubernetes

The Kubernetes open-source container- and process-orchestration system can deploy applications running either in containers or as processes. It is the standard container orchestration tool, and is available for enterprises to manage on their own or as a hosted service from cloud-service providers like Google, AWS,

or Microsoft, or by managed Kubernetes platforms from companies such as RedHat, VMWare, etc. Leveraging Kubernetes means processes can be handled automatically, allowing organizations to focus on functional applications without worrying about infrastructure components.

Many organizations decide to run orchestration on their own. This means manually handling processes, like lifecycle management, which includes storage, complex clustering, networking of nodes and pods, scaling, load balancing, and scheduling, and that requires considerable time and investment.

In fact, except when an organization requires a high degree of customization because of versioning at the master-node level, managed container orchestration services have significant advantages over running your own Kubernetes, including speed, ease of operations, and costs.

Benefits of managed Kubernetes

With managed Kubernetes, cloud providers handle provisioning, security, load balancing, upgrading, and monitoring. Managed platforms also provide different application-deployment and orchestration scenarios, including cloud-native development, containerization with orchestration, simplified deployment and management of microservices, and a well-defined DevSecOps pipeline using different tool chains.

The benefits of choosing a PaaS solution are significant. Using managed Kubernetes services will help you prepare for growth and business evolution and allows you and your teams to focus on containers and code without worrying about managing your own platform.

Parameters

Parameters	Run-your-own Kubernetes	Managed Kubernetes with cloud-service providers
Ease of operations	Low fit	High fit
Speed	Low fit	High fit
Integration with providers	Low fit	High fit
Customization	High fit	Mid fit
DevOps, microservices	Mid fit	High fit
Multi-cloud hosting support	Mid fit	Mid fit
Cost structure	Mid fit	High fit

● Low fit ● Mid fit ● High fit

Delivering apps at the pace of innovation

Modernize to drive greater business value

Breakthrough customer experiences. Always-on innovation cycles. Unprecedented responsiveness to changes in the marketplace. These are the hallmarks of digital business and the requirements for any company that wants to get – and stay – ahead today.

But in order to transform to a digital business, you need to transform your approach to the apps that are at the core of your business. Only then can you respond quickly to customer needs and deliver at the speed of ideation. Transforming means modernizing existing software, taking a modern approach to development across people, processes, and technology, and embracing cloud-native development, including microservices and containerization, hybrid-cloud integration, and agile and DevOps methodologies. It also means rethinking your approach to application services to transform it into a powerful driver of innovation.

With a strong foundation in place, you will be able to execute quickly, respond and adapt to continuously evolving market conditions, and pivot to new business models well before they're needed.

In this section, we share our perspective on transforming your approach to applications and delivering game-changing results for your business.

Execute quickly, respond to changing conditions, and pivot to new business models.

Going cloud native to get results

Adapted from *Cloud native comes of age*, a Capgemini report

The shift to cloud-native development demands a transformation in people and process as well as technology. So how can CIOs define a roadmap that turns their organization into cloud-native leaders?

Assess the application portfolio and identify priorities for cloud-native development

Because the cloud-native approach demands significant upfront investment in platforms, people, and skills, it is rarely the best way to achieve short-term, bottom-line cost reduction. CIOs need to evaluate which of their existing applications will benefit most from being rewritten as cloud native, and also which business initiatives and strategic priorities justify the investment of creating net-new cloud-native applications. Cloud native brings the greatest benefits when building new applications or services that drive competitive differentiation and top-line revenue growth. These will often be web, mobile, IoT, or big-data apps.

Build credibility with the CEO and line-of-business leaders by demonstrating a cloud roadmap and ability to deliver growth

Before they can deliver a cloud-native transformation, CIOs must justify the investment that transformation demands. This means selling the benefits of agile development and continuous delivery to the business. CIOs must challenge perceptions of the IT function as a cost center and reposition their teams as innovation partners for the business, rather than simply custodians of existing systems. They should offer a compelling vision for the transition to digital business, in which technology underpins the enterprise's ability to innovate, to attract and retain customers, and to evolve ahead of the competition.

Start small, and then scale up to develop a skilled team

Teaching thousands of developers new cloud-native skills at once introduces too much change and risk. A more feasible starting point is a single program, involving one small team in a contained area. This allows the value of these new methods to be proven in a relatively low-risk manner. CIOs should select members who are change agents and future leaders to drive these early programs. Skills learned from these pilot projects can then be fed into further initiatives on a more ambitious scale. This delivers a gradual, sustainable increase in the in-house skills base.

Adapt the IT operating model to support both business agility and stability

DevOps is the essential enabler of cloud-native development. DevOps is both a cultural shift and a technology movement. The cultural changes that DevOps brings include the removal of barriers between organizational units to enable collaborative discussions within teams. DevOps is underpinned by technology: specifically, the combination of agile tools, automated testing, and the automated provisioning of infrastructure and middleware, typically using a Cloud Management Platform (CMP) and Application Release Automation (ARA). The gradual shift from waterfall development to DevOps does not remove the need to document and test in a repeatable process with strong governance. Key safeguards must remain in place without slowing the process.

Be pragmatic in selecting technologies; lock-in risks and integration challenges are not insurmountable

If your enterprise has the appetite to build engineering expertise on the scale of Netflix or Google and you need to use special features not available in an off-the-shelf Platform-as-a-Service offering, consider building a custom PaaS with open-source components. Otherwise, we recommend an off-the-shelf PaaS, either already pre-packaged (such as Cloud Foundry or a public-cloud PaaS) or a combination of containers and a container orchestrator (Containers-as-a-Service). Complete portability may not always be practical or justifiable in cost terms, but containerization and open source offer the flexibility to build applications in a hybrid model where they exist seamlessly in different environments.

By taking a thoughtful, comprehensive approach to cloud-native transformation, organizations can achieve velocity and flexibility that is simply impossible in monolithic systems.

CASE STUDY

Improving crops with cloud-powered DNA analysis at Corteva

The challenge

Corteva Agriscience, once the agricultural division of DowDuPont, produces as much DNA sequence data every six hours as existed in the entire public sphere in 2008. The company wanted to shift away from on-premises processing and storage to ensure it could continue to scale to meet business demand.

Our approach

We worked with Corteva to replatform its existing Hadoop-based genome processing systems on AWS using a serverless, cloud-native architecture.

Results

Corteva is now able to rapidly scale and significantly reduce cost from its previous on-premises infrastructure. In addition, it gained tremendous speed and efficiency. By leveraging AWS cloud-native technology, genome processing has been reduced from 30 days to just one day.

Application-services transformation for the digital age

Adapted from Everest Group Research, commissioned by Capgemini: *Applications transformation for the digital age*

In the digital age, application-services organizations are under immense pressure to respond rapidly to market changes to help transform business models and deliver value, while remaining cost competitive. The need to address market pressures has made application services central to any forward-looking enterprise's strategy.

Despite growing aspirations for application services, most struggle to effectively deliver business value. Traditional application-services models are not equipped to meet business expectations of the digital age, as they have limited adaptability to change, poor delivery speed, inefficient processes, and limited ability to drive innovation.

Application-services priorities and objectives need to be closely aligned with business goals to serve customers faster, enhance customer experience, and scale products and services. They need to be built and evolved around four key principles: agility driven, to respond to business dynamics; business focused, to orchestrate services aligned to outcomes; efficiency based, to drive cost and operational efficiency; and innovation led, to enhance legacy applications and adopt newer solutions.

Continuous improvements in cost and operational efficiencies: Enterprises should have a laser-sharp focus on continuously evaluating their application portfolios to ensure cost and operational efficiency gains. Enterprise transformation efforts must include the adoption of modern development and delivery principles and the use of extreme automation to simplify, standardize, and automate processes.

Delivery of application services for business value: Applications play a critical role in digital businesses. It is imperative to ensure that the development and delivery of application services are centered on business needs. This requires making changes to systems with a clear understanding of the business impact they would create and their influence on the business value. Enterprises need to identify and redefine their performance metrics to measure value delivered based on operational and strategic business priorities.

Ongoing evolution of the application portfolio for agility: As enterprises optimize and modernize their application portfolios and technology landscapes, they should also simultaneously foster a culture of continuous evolution within application-services organizations. To minimize risks and maximize business value, enterprises can adopt an incremental approach to modernization initiatives to move towards a digital-ready application-services landscape.

Innovation-led approach: Enterprises should regard their innovation agendas as the core consideration for driving change across both technologies and businesses. Application-services organizations should not only take an innovation-led approach across the application life cycle, but also leverage applications innovation as a catalyst for accelerating business initiatives.

In taking a modern approach, organizations can transform application services from an activity that keeps the lights on to one that delivers considerable value to the business.

Next-generation ADM is all about business

A fundamental shift is increasingly apparent in boardrooms around the world: business leaders are starting to care deeply about applications. They are recognizing that applications are not just tangential to business results – they are the backbone of strategic initiatives and directly impact business performance, customer relationships, and growth.

That is why Application Development and Maintenance (ADM), once a mundane consideration for IT professionals, is now a hot topic in the C-suite. Business leaders are looking to ADM not only to create innovative revenue channels but also to transform customer interactions into successful, long-lasting relationships.

Simply put, the old ADM was about improving IT and developer efficiency. Next-generation ADM is all about business. It's about creating transformative capabilities, accelerating innovation, and delivering uniquely satisfying customer experiences.

Next-gen ADM services can drive the following for your business:

Making digital labor more productive: Businesses need applications to incorporate more intelligence and automation to tackle complex tasks in less time for less money. This will help ensure optimal utilization of the workforce and enable skilled employees to engage in higher-value work.

Meeting demand for hybrid cloud environments: As cloud adoption surges and companies distribute data across private and public cloud environments, it is now critical that providers maintain and migrate across cloud environments.

Incorporating business-based metrics: Assessing the impact of new technologies is a key concern for most enterprises. There is a move towards business-based metrics due to the shift in preferences and contract structures.

Harnessing automation and AI in business modeling: The use of automation, cognitive computing, and predictive analytics in business modeling and business process migration are already gaining momentum and will continue to do so as businesses see quantifiable value.

In an era that represents unprecedented opportunity to unlock business agility, it's important to remember that an organization's ability to move quickly is driven by its applications.

Practical learnings on microservices

The days of traditional, monolithic architecture are numbered, and cloud-native application development is here to replace it. Cloud-native apps are those designed specifically to make the best use of cloud infrastructure and leverage microservices, which are discrete, independently deployed components that compose a larger application. DevOps teams build microservices and APIs (application programming interfaces) and then orchestrate these services on containers or managed container platforms.

When leveraging microservices, there are a few important factors to remember:

Build with the business in mind

In the digital era, businesses need to respond faster to changing needs. In order to provide the agility and value of cloud native, microservices design should focus on single business domains. Using an API-first design approach will ensure that the microservices conform to enterprise-wide consumption and comply with security and governance requirements. We recommend using fifteen-factor design principles to achieve agility, scalability, and operational efficiency. Domain-driven design, the de facto architecture pattern for microservices, breaks up complex business domains into smaller data-driven microservices and helps define clear boundaries for each context. Microservices should be as asynchronous as the individual business processes allow to reduce dependency on complex integrations.

Design for resilience

Microservices must be designed for network and system failures, such as delays, errors, or unavailability of another service or third-party system. Keeping communications asynchronous allows for resiliency when some services fail. Microservices should also provide a default functionality in case of failures from a downstream service. This could be an error message, or, if the business case permits, a default value that is acceptable until the external service is available. Even if microservices are built for a UI screen to consume, they must be responsible for all data input validation. There are common frameworks to do this using expression language and annotations rather than code.

Ensure observability

Centralized logging and monitoring are a must for distributed microservices. This enables the quick, manageable tracking of failures when multiple APIs and services are involved. When services are built along with tracing and alerting mechanisms, the mean time to resolve the error is minimized. Log events for timeouts and shutdowns should include the level, hostname (instance name), and message. Log events can also be used for capacity planning and scaling, for example, indicating which services need higher instances. There are multiple frameworks for centralized logging which developers can use in a plug-and-play manner.

Enable automation

Testing tools should be used for the integration of services. Start with unit testing but don't overlook the importance of contract testing to ensure that APIs are functioning as per the agreed request and response. You should also use automation testing in the build pipeline to provide instant feedback on check-ins and failures. With these check points in place, you can be sure that untested code doesn't make it to the development environment.

In the digital era, microservices are key to achieving digital business agility, and leveraging them for maximum value requires a transformation in processes.

CASE STUDY

# Creating the viewing experience of the future for a large media company

The challenge

A media company was looking to modernize its existing audience research platform to gain agility and scalability and lay the groundwork for growth. The existing platform could not sustain sudden surges during major seasonal sporting events, and the team was looking to modernize to scale more easily and deliver software more nimbly.

Our approach

We worked with the organization to develop a model for agile product development leveraging a microservices architecture. We used the 12-factor design principles for cloud-native architecture, ensured high availability and auto-scaling, built a continuous-integration and delivery capability, and built responsive UI that allowed users to run the applications across multiple devices.

Results

The company has seen improved report execution performance, a significantly improved user experience, and a drastic reduction in time-to-service introduction from eight weeks to less than one hour.
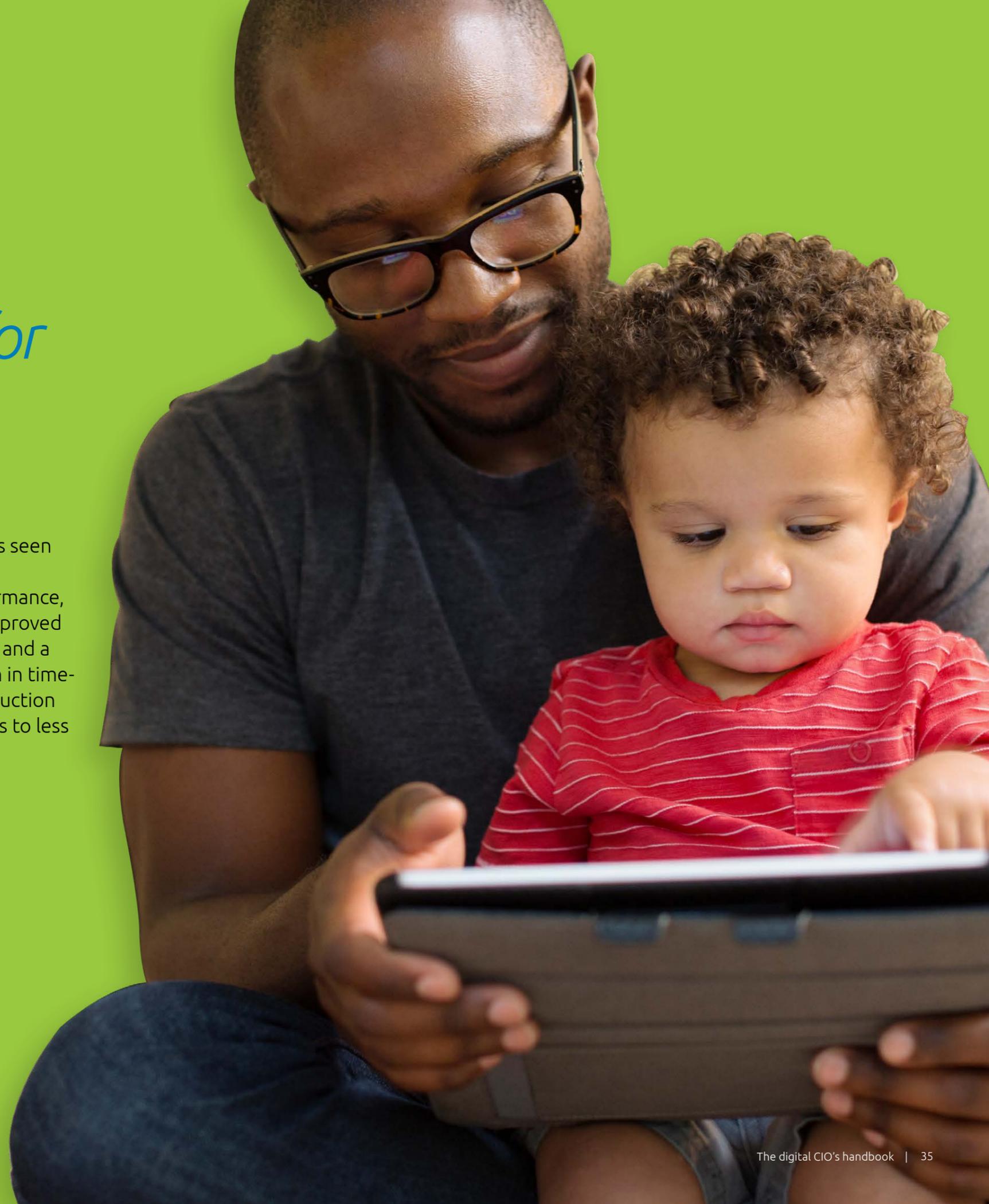
How to become an integrator and join the API economy

Adapted from the Capgemini report *Unlocking the hybrid integration dividend*

Businesses are pursuing digital transformation to achieve a step change in their speed, agility, and ability to innovate. Achieving this rests in large part on the organization's ability to access data at great speed and breadth. Modernized hybrid integration and microservices-based APIs are the means to making that happen.

APIs unlock the data and unique functionalities of applications residing in disparate systems inside and outside the enterprise, often in multiple clouds as well as legacy on-premises environments. Modern integration tools connect all these applications and their functionalities. There are different approaches to hybrid integration. Here are some of the possibilities and transformation action plans for each.

Scenario 1: Cloud-first strategy adoption

The journey to the cloud is underway for most organizations, whether it be rehosting legacy applications or refactoring and rewriting applications for the new cloud environment. Some organizations are also replacing existing core legacy applications with SaaS applications, such as Salesforce, NetSuite, ServiceNow, and Workday.

Transformation action plan:

- Define an optimal cloud-first implementation strategy
- Evaluate data security and regulatory/compliance requirements
- Model the integration features needed to support your short-, medium- and, if possible, long-term business and technology needs
- Select an enterprise-class hybrid integration platform that can support your transition to a cloud-based applications architecture.

Scenario 2: API-first strategy

There are several different reasons for and approaches to adopting an API-first strategy. Some organizations are creating a portfolio of APIs from a consumption standpoint, such as for mobile apps and self-service portals. Others are integrating cloud-based and cloud-native apps, along with existing legacy enterprise apps for seamless connectivity between back-end and front-end systems.

Transformation action plan:

- Identify and define your organization's goals. For example, incremental revenue streams, opening new business channels, and improving customer or employee experience and satisfaction levels.
- Leverage a comprehensive API assessment and adoption framework to assess how an API-led integration approach can address integration flows, unlocking of siloed data and services, and reusability, security, and governance requirements.

Scenario 3: Legacy modernization

To modernize legacy IT estates, many organizations are refactoring their legacy monolithic applications using a microservices and API-based architecture. Others are adapting legacy systems to support modern business and technology needs by implementing an integration layer with services and APIs to intermediate their legacy systems and various consumption channels. This allows legacy systems and applications to coexist with modern technologies, such as cloud-native apps, SaaS, IoT, and mobile.

Transformation action plan:

- Identify the monolithic legacy systems that form the backbone of your organization – applications that are technologically incompatible with newer ones
- Create a business case for modernizing your legacy IT estate
- Leverage available capabilities to move your legacy transformation forward at pace, including a modernization framework, core integration framework, and a robust architectural approach.

Scenario 4: Legacy middleware/ESB modernization

Whatever your business and technology priority, a mature hybrid integration strategy is essential to achieve sustainable business growth. Organizations are looking at born-in-the-cloud iPaaS or hybrid integration platforms to support their digital transformation initiatives and to cut the high operational costs associated with legacy middleware platforms.

Transformation action plan:

- Make a sound business case for modernizing your integration platform
- Use a comprehensive cloud-integration assessment framework to clarify the advantages of adopting a modern, iPaaS-based integration platform.

Whatever journey you take, one thing's for certain: leveraging API-led integration is key to succeeding in the digital era.

Realigning IT to the business with app modernization

Your on-premises applications were great at one time. That's why you chose or built them, after all. But as digital business continues to take hold, your on-premises apps and infrastructure are likely no longer aligned to your organization's requirements.

In the digital world, your applications need to be cloud-ready, enabling you to optimize operations and transform to innovate faster, respond more quickly to customer needs, and leverage breakthrough technologies. But requiring modern capabilities running on flexible infrastructures doesn't necessarily mean starting from scratch.

Application modernization is the process of aligning legacy software to your current business needs, whether that means refactoring, rearchitecting, or replacing. It helps you minimize the in-house server footprint and the costs that come with it. Even more importantly, it allows for greater agility, speed, scalability, reliability, and security.

But what's the difference between the various application modernization approaches? And what's the right approach for your needs? Read on for our primer on app modernization.

Rehosting

Before we get into the various approaches to app modernization, we should discuss rehosting. While it doesn't technically fall into the category of app modernization, rehosting is the first step many companies take towards modernizing their application portfolios.

What is it? Rehosting is simply moving an application from its on-premises environment to a modern cloud infrastructure. It is the most straightforward of the four options and generally delivers dramatic boosts in performance.

Why rehost? Companies choose to rehost an application when they are pleased with its performance and functionality but need the benefits of an agile cloud infrastructure. They retain the familiarity and functionality of the original application while reducing their data-center footprint and networking, compute, and storage costs. They also reduce their capital investment and maintain business continuity.

Now, let's focus on application modernization.

Approach 1: Refactoring

What is it? Refactoring is restructuring code to improve performance without changing its intended function. Companies will opt to refactor applications when, as in the case of rehosting, they are basically satisfied with the functionality but the code needs to run on a more modern foundation, such as a current operating system.

Why refactor? Refactoring applications reduces technical debt, improves performance and efficiency, cuts costs, and creates code portability where none existed before. As importantly, refactored applications can receive all vendor software updates, ensuring security standards and performance are maintained.

Many organizations, for example, have machines running Windows Server 2008. Microsoft support for those operating systems is about to expire. With minimal changes to the underlying structure but no alternation of the software's functionality, these applications can run on modern foundations and move to flexible cloud systems. Once refactored, applications can be containerized or leveraged with PaaS services.

Approach 2: Rearchitecting

What is it? Rearchitecting transforms single-tier architectures into multi-tier systems in which functions and processes are divided in a modern cloud implementation. This is far more efficient and delivers immediate reliability gains. When rearchitecting, applications transform from monolithic to microservices-based architectures.

Why rearchitect? Many companies built their systems when their organizations were much smaller and simpler, but with growth, existing architectures are often too simplistic to meet current demands. In fact, we regularly see companies relying on single-tier architectures, in which the operating system, application, and database all exist on the same server. However, single-tier systems have only limited scalability and poor uptime and reliability. For example, if one component comes under a heavier load, the entire system slows. Similarly, if a component fails, the business will simply grind to a halt. Rearchitecting these to multi-tier cloud instances eliminates these concerns.

Rearchitected applications can be containerized or moved to PaaS or serverless environments to deliver easy portability, more efficient software development and deployment, and a level of future-proofing that would not otherwise be available.

Approach 3: Replacing

What is it? There are two choices when it comes to replacing aging, on-premises systems: redeveloping with new code built for modern cloud infrastructures using current development tools or shifting to SaaS. Replacing is the most labor-intensive option of all three app modernization approaches and may involve some level of business disruption.

Why replace? The replace option is for companies that are in need of a specific function, such as payroll or inventory but know that the legacy system is so out of date that starting from scratch in the cloud or moving to SaaS would be the most efficient option. Companies that rebuild have an unprecedented opportunity to create functionality that exactly matches current needs and future requirements.

When choosing between rebuilding yourself or going with a SaaS solution, it makes sense to build functions that are highly proprietary, confidential, or critical to your organization from a competitive standpoint but go with SaaS solutions when there's a best-of-breed option available. For example, organizations likely wouldn't build their own CRM system, given the availability of powerful existing SaaS solutions. On the other hand, telecom providers may build back-end inventory management tools or digital billing solutions, given the importance of both to retaining a competitive edge.

Whatever approach you take, at its core, application modernization is about realigning your technology to your business needs and doing so in an efficient and cost-effective manner. All application modernization options deliver the same fundamental advantages: shrinking the in-house server footprint to reduce the associated costs, including networking, compute, storage, and backup; improving agility, speed, scalability, security, and reliability; and reducing costs and making expenditures more predictable.

Five serverless architecture myths: separating fact from fiction

The industry has started thinking beyond virtual machines, and serverless technologies, in which application infrastructure is provisioned by the cloud platform, are taking center stage. Because it allows companies to shift away from the 24/7 run of servers and pay only for the compute cost of specific business functions through fully modularized applications, serverless is an increasingly popular option. But despite the value serverless can provide, adoption maturity is still in its early stages. Because of this, there are a number of myths about serverless circulating in the market, and it's important to separate fact from fiction and explore the real value serverless brings to the enterprise.

1 **Myth #1: Serverless doesn't perform as well**

One of the biggest misconceptions related to serverless has to do with performance. Many think that serverless functions have longer warm-up and API response times, but this is a misperception related to the belief that one size fits all. In order to see benefits like cost reduction and faster execution speeds, you must configure the right memory size for the level of demand. This depends on function complexity related to the particular business process.

2 **Myth #2: Serverless is expensive**

It's a widespread belief that serverless computation is more expensive than container-based APIs but, much like the performance myth, serverless is only more expensive when less-than-optimal services or domains are run in a serverless environment. In fact, when executed properly and in the right domain, serverless leads to more cost savings than traditional models thanks to pay-per-use and the elimination of the investment associated with infrastructure management and sysops. Business domains requiring higher levels of scalability and elasticity are ideal options for serverless, whereas when usage patterns are relatively flat, there may not be any significant cost savings.

3 **Myth #3: Serverless creates vendor lock-in**

Because cloud-service providers generally supply and manage serverless environments, many believe serverless leads to vendor lock-in. In reality, though, every cloud provider has its own version of serverless architecture and the concept is the same across all. This means platform-agnostic frameworks can be used to create a wrapper around serverless services and make the code independent of any specific vendor.

4 **Myth #4: Serverless isn't secure**

Clients often express concern about security, given that it's hosted on shared infrastructure. Although the systems are shared, they are highly secured and PCI compliant. In fact, serverless is no less secure than other cloud-based environments.

5 **Myth #5: Serverless is difficult to manage**

Clients are often concerned about a perceived lack of industrialized tools supporting serverless application deployment and management. However, serverless functions are widely supported by many coding languages (Java, Python, Node.js, .Net), popular CI/CD tools for deployment (Jenkins, VSTS, CodePipeline), and industrialized tools for monitoring (New Relic, Kibana, Digital Elk), making it not only easy but also feasible to manage and deploy enterprise-level serverless-based applications.

It's also a common myth that troubleshooting is difficult on serverless functions. But as serverless has proliferated, so have the troubleshooting tools that give companies the ability to manage their serverless architectures autonomously. For example, monitoring tools like New Relic and Kibana are easily integrated with serverless functions for application log management and monitoring. Additionally, some cloud providers enable remote function debugging.

Though serverless is not the answer to every business challenge, when used as intended it can provide significant advantages over widely used on-demand cloud services.

Embracing Monday's idea as Friday's reality

Reimagine your business with the speed of a start-up

In the digital world, organizations need to reimagine business with the speed and agility of a start-up, embracing new business models and ways of working. This means that what used to take months should only take days, that innovation should be always on rather than one-and-done, and that IT should continuously drive business value instead of just driving down costs.

Doing this entails shifting from a project-centric model to a product-centric model, leveraging emerging technologies like IoT and AI/ML, and transforming people, processes, and culture to align to the new business reality.

Whether you are streamlining operations, adapting people and processes to shift to new and agile ways of working, or unlocking novel sources of revenue, implementing changes that will allow you to make Monday's idea a reality by Friday is key to thriving in the digital era.

Transform people, processes, and culture to align to the new business reality.

An operating model for enterprise DevOps

Over the past few years, DevOps has rapidly evolved from an enabler of development efficiency to a driver of business agility for enterprises. DevOps is the digital foundation for improving time to market and launching innovation initiatives to respond to dynamic and disruptive market scenarios. Here is what we see as the key ingredients for a successful enterprise DevOps strategy.

The ability to run agile teams at scale across the entire business and technology portfolio of an enterprise. An enterprise portfolio should ideally be structured in a logical hierarchy of value chains and products, with the sprint teams aligned to products. Sprint teams operate seamlessly across the service areas of business, development, and operations to deliver speed, quality, and innovation. Sprint teams take end-to-end responsibility for products within a value chain. "Product orientation" is a trend many enterprises across sectors are adopting.

A single agile-team construct for addressing development and maintenance activities for applications. This means managing projects, enhancements, fixes, L2, L3, and operations through an integrated product backlog and a common agile governance. A certain capacity of agile teams needs to be reserved for maintenance and operations work. In addition, service-management aspects such as SLAs, 24/7 support, and emergency fixes need to be handled through synergy and rotation within the same agile teams.

A multi-technology DevOps strategy that is attuned to the unique needs of different technology platforms and business domains. The typical considerations for a DevOps target model include the nature of skills, tooling, release speed, the platform being used, and the extent of automation. These considerations are unique for different technology clusters, such as SAP, digital, and middleware. Moreover, they vary based on whether the application is a system of records, system of innovation, or system of differentiation. DevOps CI/CD is very specific to the technology platform that is used. For example, we need specific tool chains for Java, .NET, ETL, or BI applications. Packages such as SAP have their own tooling that is native to the platform.

A centralized DevOps guild. Set up a central DevOps team to steer the overall DevOps strategy and way of working for the sprint teams across the enterprise. This function is also responsible for strategic decisions on standardizing the stack, automation, and scaling across the enterprise.

Automation everywhere. Drive automation across the entire lifecycle of a service: continuous integration (code quality, build, and unit test automation), continuous testing (UI test automation, regression test automation of end-to-end scenarios spanning digital to middleware to ERP), continuous monitoring (flow and feedback – user telemetry, proactive diagnostics), continuous deployment (deployment strategy integrating application, database, environment configuration aspects across application and infrastructure, infra as code).

Shared KPI framework across partners. This is a multi-partner collaboration model defined and driven by the central DevOps guild – the roles, responsibilities, and shared objectives focusing on end-to-end KPIs.

New-age infrastructure as an enabler of business agility. Modern enterprises choose infrastructure platforms with cloud-native capabilities, enabling the creation of application services, and not merely infrastructure services. This means highly agile applications running on microservices and powered with native CI/CD can be easily setup on such platforms. Enterprises have started incorporating these ingredients into their way of working. As a result, it has become imperative for IT vendors to incorporate these characteristics into their sourcing models, delivery approaches, and contractual constructs.

Bridging the digital-talent gap

Adapted from the Capgemini and LinkedIn report
The Digital Talent Gap: Are companies doing enough?

In an increasingly digital economy, those organizations that bridge the talent gap will enjoy a competitive edge over those who don't. A defined digital talent strategy that meets both business objectives and the needs and preferences of digital talent is critical for a sustainable and successful digital transformation. Based on what we have learned from our research – as well as our experience in the field with our clients – we believe there are six areas organizations should focus on to solve digital-talent challenges:

Align leadership on a talent strategy and the unique needs of digital talent. Talent and human-resources executives – as well as business leaders – need to acknowledge the digital talent gap and play their part in narrowing it. Leadership will also have to play a greater role in seamlessly integrating new digital talent into the workforce. Dealing with a multi-generational workforce requires greater awareness of employee strengths, their working styles, and their aspirations.

Diversify your recruiting approach. Organizations should think creatively about where to look for talent, as opposed to just focusing on which talent to look for. Focus on recruiting channels where people are likely to be found, such as by establishing offices in technology hubs that are more accessible to digital talent. Organizations can also collaborate with educational institutions to develop the pipeline and recruit new digital talent, and leverage social media and other digital channels. Unilever, as part of an effort to transform its recruitment, uses gaming techniques.

Create an environment that prioritizes and rewards learning. Given that upskilling is a priority for digital talent, organizations should ensure their people feel supported in their decision to participate in learning and development. Organizations can also consider ways to incentivize learning.

Chart a clear career-development path. Digital talent want to find meaning in their work and be an integral contributor to driving value for the organization and themselves. A recent study found that most pacesetters map the digital skills needed for each job level and ensure people have a clear development path.

Give digital talent the power to implement change. Organizations need to build an acceptance for failure. Digital talent is unlikely to thrive in an environment that lacks freedom to experiment and fail. Innovation will also suffer if a culture of experimentation does not exist.

CASE STUDY

Reinventing a wireless carrier with a platform for the future

The challenge

Focused on breaking industry dogma with amazing customer service, this carrier sought to deliver products to the market at fantastic speed through a digital-company strategy and organization.

Our approach

Capgemini delivered an end-to-end digital transformation from strategy, agile implementation, and managed services, leveraging microservices, Apigee Management, continuous integration, delivery, testing, platform, and infrastructure management.

We reconstructed the legacy billing systems using microservices running on a Pivotal Cloud Foundry platform. The company now has an agile digital architecture and platform for the billing system of record that keeps up with its dynamic business environment.

Results

The business team now uses web, retail, and care channels to flexibly and rapidly adapt and scale services, with continuously improving customer experience. The cloud-native architecture reduced manual steps by 50% and reduced end-to-end billing domain delivery timeframes by 25%. Now ideation to execution takes days, not months.
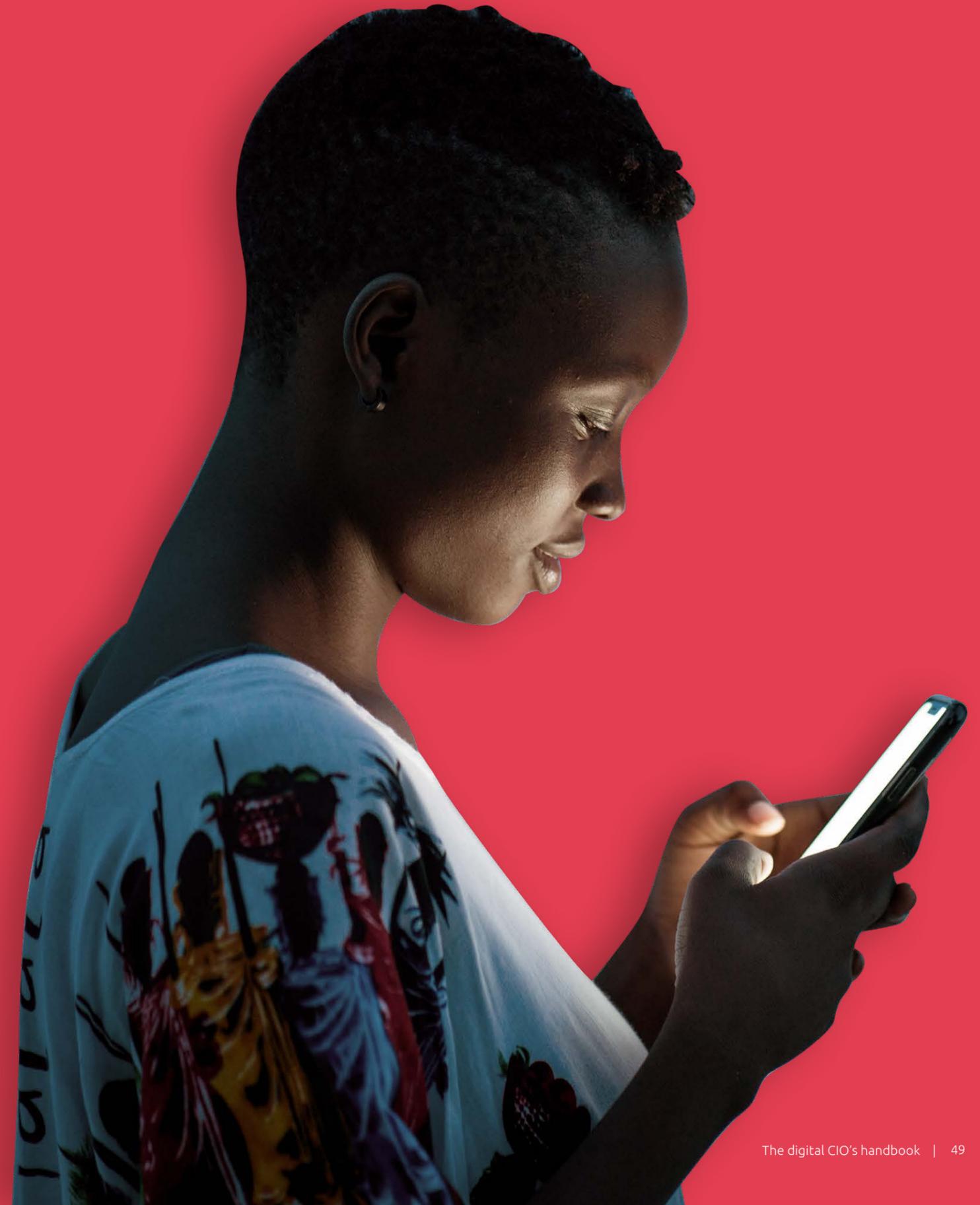
From project-based to product-based development: succeeding with a you-build-it-you-own-it model

With the rise of digital and cloud-native technologies, application development has fundamentally changed, enabling unprecedented levels of business agility and creating the need for a shift to a DevOps way of working. In the traditional waterfall approach to development, phases were disparate and sequential: the business and IT requirements phases were siloed, as were the architecture and design phases. Given the limited duration and pre-defined scope for each phase, this has often been referred to as a project-based approach to application development. With the increasing uptake of DevOps, this traditional model has been turned completely on its head, and what used to be project-driven development is now product-driven development.

With a product-driven approach, there are no separate phases or siloed teams. Rather, a single team of cross-skilled people – a product team – works closely together across all aspects of development to ensure optimal outcomes, from provisioning to running the SCRUM team to product development, CI/CD pipeline, and product release. If a team owns a feature, it owns it end-to-end, so there is no longer a single team responsible for testing and nothing else. It's a you-build-it-you-own-it model in which everyone shares responsibility to maximize speed and agility.

For many organizations, shifting to a product-driven approach to development represents a major cultural and technological shift. To get it right and see optimal returns, there are a few considerations all organizations need to keep in mind:

Ensure it's a joint initiative between business and IT. The reason for shifting to a DevOps way of working is to align business and IT teams and create a continuous feedback loop from both sides that allows for greater agility. Because of this, ensuring a DevOps initiative is fully owned by both the business and IT is critical to success. But achieving this can be a challenge given that development has historically been an IT-led and IT-specific endeavor. To be successful, the business needs to be a core part of the DevOps team. A POD structure should be composed of cross-functional and multi-disciplinary teams where the business (the product owner) provides continuous feedback, governance, and guard-rails to drive technology evolution, and IT brings in the right toolsets and controls to drive feature richness. But it's not just about having new processes. This alignment between business and IT also represents a major cultural shift that leaders need to plan for.

Make operations an integral part of the process. One of the most important components of the continuous feedback loop inherent to a product-driven development approach is ensuring operations is woven into the overall DevOps process. Traditionally, operations has been an afterthought and a separate phase that was overshadowed by other phases of development and testing. In a product approach, the development team and operations team are one and the same.

In the POD- based model, developers have to think more holistically about factors like the automation of potential error or defect scenarios from the very beginning of the development process because they are ultimately responsible for fixing defects when they arise. If they don't consider them or build them in at the start of the process, development isn't going to be optimized or efficient. Because this emphasis on operations calls for a significantly different set of skills than what a traditional developer would have, a strong training and recruitment plan needs to be put in place.

Ensure you have the right tooling. We often see organizations struggling to fully realize the benefits of DevOps because the tools they use haven't shifted alongside the significant process changes they've made. For example, while Excel and Jenkins are perfectly appropriate in traditional development models, Jira and Slack are more appropriate for the DevOps way of working.

Also, in an optimized POD-based shared-responsibility model, it is important to automate the maximum number of tasks that require multiple teams to collaborate for a single outcome. Test automations should include not just functional tests but also security, infrastructure, and network tests, otherwise teams will find themselves falling into the traditional model where multiple teams perform siloed tasks. Organizations need to rapidly shift from DevOps to DevSecOps, where security is no longer thought of as an external component or team.

Remember that velocity takes time. It's important to remember for product visioning and grooming and release plans that it takes time for the team to achieve the level of collaboration and efficacy required to see results. We often encounter teams with unrealistic expectations about how soon they will see gains in agility and speed, but in our experience it takes at least four to five sprints along with a robust change-management and governance plan. Being realistic is important for managing expectations, and while it may take time to see high velocity, remember that once you do, it will continuously increase at a much faster pace than in the traditional model.

Training to transform your workforce for the future

As organizations everywhere seek to achieve greater degrees of agility and competitive advantage, once-breakthrough technologies like cloud native and serverless are becoming increasingly mainstream as newer technologies like AI take hold. With the pace of digital transformation accelerating, IT departments need to not just keep pace but stay ahead – and CIOs and IT leaders need to ensure that their workforces are ready to take on this newly digital world.

Having cutting-edge capabilities is one thing; having the skills to take advantage of them is another. In the traditional world, development was siloed with the focus on core Java, but IT departments of the future will depend on full-stack developers whose skills span the entire IT portfolio.

But many organizations are held back in their digital journeys not just by a lack of next-generation digital skills but also by the absence of a plan for recruiting those skills and retaining them. For most IT organizations, building a sustainable digital- and future-ready workforce requires a complete overhaul of traditional approaches to training in favor of a new workplace culture.

At Capgemini, we've not only seen the need to transform amongst our clients but we've also experienced it firsthand. As we partner with clients to make digital business a reality, we've had to evolve our own organization and embrace new approaches and processes for training. Along the way, we've identified a few key imperatives and best practices for an effective training program that will help build and retain the workforce for the future of IT, whether your focus is on upskilling or on reskilling. These imperatives are:

Make it immersive

In the fast-paced world where IT landscapes are constantly evolving, your IT workforce needs to be similarly agile. The typical approach of long-term, topic-based, academic learning needs to evolve to focus on short-term, use-case-focused, and hands-on learning modules. Traditional training was more theoretical, but today we make sure that 80% of our training is hands-on with real-life, end-to-end coding scenarios. That emphasis is carried through to the end of the course, where instead of the typical multiple-choice test we hold "coding cafes" where trainees are given a use case and expected to spend the day coming up with a solution.

Make it individual

In a field in which the newest skills are in high demand and developing a range of skills is important for long-term success, each employee needs to feel he or she has a stake in the training journey. Rather than management pushing specific training, individuals need to be empowered to upskill themselves according to their own goals and preferences. This also means ensuring that on-demand, multi-channel modules and third-party training platforms like Udemy or Pluralsight are leveraged so employees can learn anywhere, rather than just at their desks. Role-based learning maps help employees chart their own paths and work towards their goals.

Make it ongoing

It's important to continuously reskill employees to embrace the new. This means creating a culture of continuous learning so employees can learn new skills at any time, regardless of what project they're working on. Not only does this help ensure that you'll continue to deepen your internal expertise, it also helps employees feel engaged and interested in their work.

Embracing new business models for the digital era

In the digital era, expectations of the customer experience are increasing. The steady release of new technologies creates non-stop opportunities for disruption. Always-on innovation cycles mean today's competitive differentiator can quickly become tomorrow's forgotten feature.

In this environment, organizations need to get up to speed – or get left behind. Companies are looking for opportunities to transform their business models ahead of the competition. For example, we worked with a quick-serve restaurant to build out a platform that would allow it to expand its exclusive B2C focus to include B2B. We also supported a manufacturing powerhouse as it brought together its experience and expertise to create a new digital agency. Additionally, we helped a wireless carrier revolutionize the customer experience by replacing monolithic development with a DevOps approach that allowed it to release promotions significantly more quickly.

In a world where what got you here won't get you there, it's no longer a question of whether you will need to develop and adopt new business models – it's how. For organizations that must contend with a legacy estate but want to disrupt or move like a start-up, here are a few considerations to keep in mind:

1 **Don't transform for transformation's sake**

While it may be tempting to dream of your organization becoming the next Uber or Netflix of your industry, that may not be the optimal transformation trajectory for your business. Although transformation is increasingly imperative across all industries, what transformation looks like is very different for every organization. Start by understanding your organization's specific objectives, and then work backwards to uncover the transformation levers needed to get you there. An in-depth assessment of your application portfolio is critical for developing a clear business case and roadmap.

2 **Modernize first, transform later**

Before undertaking any transformation initiative, it's important to ensure you have the right technology foundation to allow you to deliver on your objectives. In your quest to become an innovation engine or rapidly pivot to respond to changing customer needs, your legacy infrastructure isn't going to cut it. While this doesn't mean you need to fix everything at once, you do need the basics for delivering on your digital vision along with a solid strategy for ensuring every element of your application portfolio will ultimately serve in your quest to transform. This may mean taking a lift-and-shift approach for some of your most business-critical applications while refactoring those that are key to competitive differentiation in the marketplace.

3 **Don't be afraid to spin off but don't start from scratch, either**

For some organizations, the burden of the legacy estate is such that it makes sense to create a completely new entity, at least temporarily. When undertaking a major transformational change, it may be most effective to eliminate any constraints by creating a spin-off of the legacy organization. This will ensure that you have a team that's open and receptive to change, processes that are optimized for agile ways of working, and a start-up culture that's free from the silos that hold so many organizations back. When doing this, it's important to keep in mind that you don't need to start completely from scratch. Leveraging pre-defined industry blueprints and pre-built software components can help your vision come to life more quickly.

4 **Think in terms of ecosystems, not infrastructure**

In the old days, technology was all about enterprise architecture. Today, it's all about cloud ecosystems and the services within them. In an ecosystem model, you no longer own the services, you don't control the SLAs, and you've shifted from a maintain-and-operate model to one of provisioning and consumption. This means you can focus on your business objectives rather than on underlying technology. Having a strong ecosystem means working with a combination of cloud providers in a multi-cloud model. This will ensure you've selected the right mix of services with your needs aligned to the strengths of the cloud providers.

5 **Remember that it's not just about technology**

As your technology changes, so must your people, processes, and culture. The move to cloud turns the traditional way of working completely on its head and, if you don't plan for it, you won't see the benefits of the underlying infrastructure transformation. You need to adapt your processes and prepare your people for the shift to agile ways of working where IT and the business operate in lockstep in a product-centric model. Too often, we see companies underestimate the level of change management and communication that is required to drive successful transformation amongst teams that are used to the old way of working.

6 **Never stop innovating**

It's critical to remember that in the digital era, your work is never finished. Once you've successfully transformed, you need to keep one eye trained on what's ahead. Having a strong technology foundation that will allow you to rapidly spin up new environments and bring ideas to life in hours and days rather than weeks will be instrumental in ensuring that you stay ahead of what's next. It's equally important to ensure you have a team made up of innovative thinkers and foster a workplace culture that's conducive to fresh thinking and new ideas.

CASE STUDY

Building the internet of beer

The challenge

A fast-growing sports bar and grill that sells more draft beer than other restaurants in America sought to optimize and flexibly integrate the mix of regional and national beers at each of its more than 1,200 restaurants to rapidly respond to local trends and consumer preferences.

Our approach

Using IoT sensors on beer taps to capture pour and sales data, the solution uses APIs to integrate with the organization's existing IT platform, including its PoS systems, print menu supplier, and ServiceNow software, all while enabling management of inventory from a centralized platform.

Results

Not only did the organization see an increase in beer revenue, it also saw a double-digit reduction in the amount of beer shrinkage. Both local- and headquarters-based managers gained access to real-time pour data, reducing the time and effort to make business decisions. Unexpectedly, the IoT sensors eliminated the injury-prone task of lifting kegs to approximate remaining beer levels, resulting in a 50% drop in worker's compensation costs.

Fast-tracking transformation initiatives with pre-built solutions and accelerators

Whether getting IT transformation off the ground or spinning up new offerings or experiences, moving quickly is the only way to get and stay ahead at a time when always-on innovation is the norm. Because of this, "fail fast" is among the most common mantras in today's corporate world. However, every corporate leader knows that the tolerance for failure doesn't always go hand in hand with professional success.

Given this reality, IT leaders need to find ways to get their digital transformation initiatives moving quickly – at low risk. One of the best ways to do this is to bring in external expertise and vendors who can deliver pre-built solutions and components. Although many organizations we work with often initially think they need or should do the majority of the work themselves, it's important to remember that all or part of any new digital feature or capability an organization wants to build has likely been created already by someone else.

From packaged industry solutions to accelerators and libraries of software components that enable next-gen capabilities, there are many ways to leverage pre-existing content to enable your team to spend less time developing and more time delivering.

For example, a quick-serve restaurant looking to create a highly personalized customer experience could plug in pre-built components rather than spending the time building facial recognition, product ordering, or menu-management capabilities on its own. In the manufacturing sphere, we leveraged pre-built code and capabilities to help an organization go live with a pilot for a worker-safety and productivity solution in less than two weeks.

Yet many IT organizations still operate in a do-it-yourself mindset, where they spend time building

rather than leveraging pre-existing solutions. There are inherent risks to taking this approach, and these organizations miss out on some of the benefits that come with pre-packaged offerings and capabilities beyond just speed to market. Here are a few:

Skills optimization. When it comes to digital transformation, skills around new technologies can be hard to find. Leveraging pre-built solutions reduces the time and the effort to ramp up the right team, so organizations don't miss their window of opportunity to get to market ahead of the competition.

Focus on differentiation. Using pre-built solutions also frees up the bandwidth of the current team to build features and capabilities that differentiate your organization from the competition, which is a capability that can only come from within. The less time your team spends developing functionality that can come from elsewhere, the more time they're able to spend developing capabilities that set your organization apart.

Built-in best practices. Because digital initiatives include new and maturing technologies like cloud, IoT, and wearables, it can be difficult to fully understand potential challenges or failure points when approaching these initiatives on your own. With pre-architected capabilities, organizations have greater peace of mind and, in general, higher quality, given that everything has been previously tried and tested. For example, when leveraging wearables as in the worker-safety solution previously mentioned, manufacturing organizations spend a lot of time ensuring that battery life is sufficient or that devices are intrinsically safe. By leveraging pre-built capabilities, they can instead focus on reporting and results.

Outside perspective. When companies build everything themselves, they risk missing out on external perspectives that could generate new ideas and opportunities that hadn't been considered. For example, many manufacturers may think the only way to leverage their machine data is through a predictive-maintenance lens, when, in reality, there are myriad ways an organization can benefit from access to this information, from automated root-cause analysis to predictive quality.

Freedom to experiment. Initial overinvestment without sufficient ROI is a risk when it comes to developing new capabilities. Digital transformation in particular requires experimentation and pilot projects before scaling up, but the ability to run proofs of concepts can be elusive in a do-it-yourself approach where dollars already spent may prevent companies from pulling the plug at the right time. By leveraging pre-built solutions and capabilities, organizations can experiment with minimal investment – and minimal risk.

Whether adopting a full scale, end-to-end solution, leveraging accelerators combining code with execution capabilities, or using pre-existing software libraries, organizations that leverage pre-built solutions benefit from faster speed to market and much more. The benefits are further amplified if pre-built code comes from vendors who have a strong understanding of both business and varied digital technologies like cloud or AI. Organizations should take a close look at their digital transformation roadmap and identify areas where they could benefit from pre-built code or capabilities.

IN CONCLUSION

It's time to make digital business a reality

No matter the industry, focus area, or audience, one thing is clear for organizations around the world: it's time to make digital business a reality by harnessing the power of cloud and application technologies. It's the key to staying ahead of the competition, maintaining customer loyalty in an increasingly demanding environment, and enabling continuous innovation in a world that demands constant change. Whether you're at the very beginning of your digital journey or you've already begun the process of transforming your IT landscape, it's crucial to ensure you're laying the groundwork for a digital agenda that will deliver returns for your organization over the long-term.

Capgemini has worked with organizations of all types to make infrastructure invisible, deliver apps at the pace of innovation, embrace Monday's idea as Friday's reality, and accelerate business to the speed of digital. To any IT or business challenge, we bring an obsession with digital business, expert and passionate people, and an outcome-focused approach that delivers results, and we'd be happy to work with you to explore what's possible and make digital business a reality.

Let's make digital business a reality today

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