Modernization: What's Taking So Long?

MongoDB

Table of Contents

Introduction

Modernization is a long but necessary journey in today's economy. Despite various cultural and technological hurdles that must be overcome in a modernization effort, the potential rewards and ever-evolving nature of the journey make it an exciting and essential experience for any organization. From building smarter apps and great customer experiences to AI-powered solutions and edge computing, modernization has the potential to once again revolutionize the way businesses work with and act upon data.

Aside from being a significant technical challenge to pull off, modernization can also draw out differences between stakeholders. While business leaders tend to focus on investment dollars and ROI, IT leaders want to align the tech stack to the larger business strategy. This is made possible through modernization because it helps businesses move fast and build great app experiences while ensuring the security and consistency of technical systems. So striking a balance between agility and stability is a shared responsibility for both business and IT leaders. While desired outcomes can vary across the organization, there must be a shared focus on one particular outcome: an upgraded, future-ready infrastructure that can provide customers with a seamless, satisfying experience.

With an eye toward both the technological and business advantages of modernization, this white paper will guide you through the major drivers of modernization from different perspectives. In addition to best practices on how to plan for a worthwhile effort, you'll learn how to discover and avoid the common pitfalls of modernization, optimize your chances for success, and achieve both the technological and business advantages of a successful modernization project.
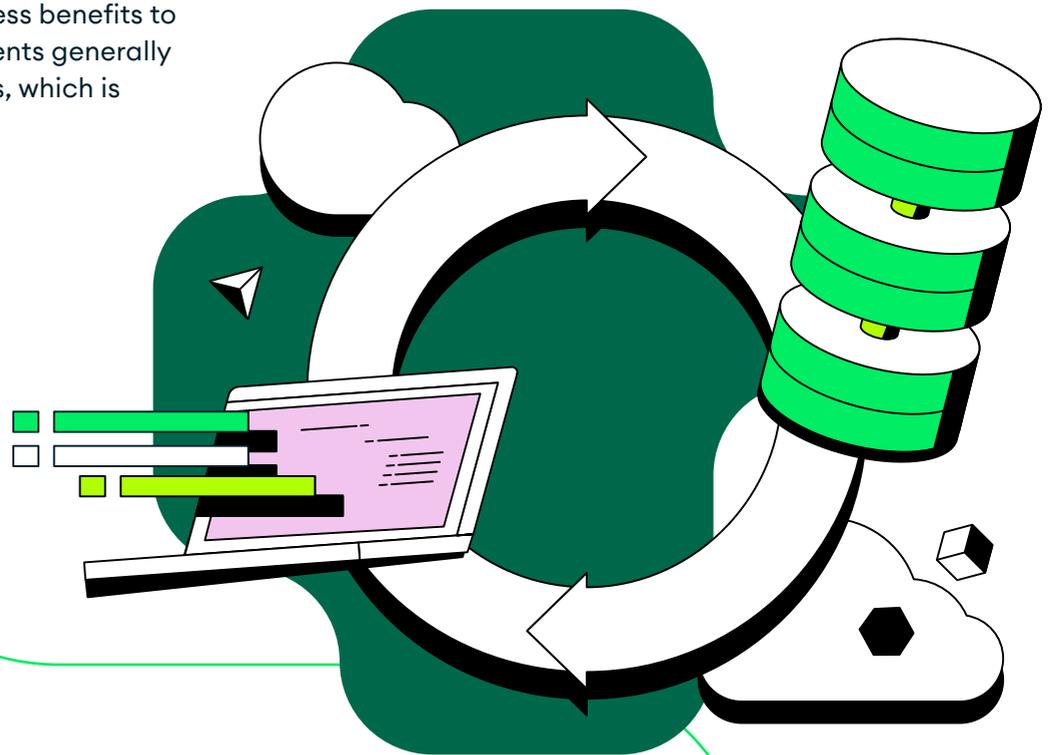
Modernization: Business Drivers vs. Technology Drivers

We've become so accustomed to intuitive and frictionless user interfaces and experiences (UI/UX) that when they're missing, we notice it immediately. Whether it's a slow-loading application or a search result with stale information, experiences that fall short of expectations leave users dissatisfied and underwhelmed, who will either stop using the application entirely or seek out competitors that deliver the digital experience they desire. You might not gain an advantage through great UI/UX, but you can certainly lose one just by falling short of customer expectations.

That's not to say that competitive advantage can't be gained through modernization. One of the biggest advantages available today is leveraging data analytics, Generative AI, machine learning, and other advanced augmentations to build smarter applications and deliver more personalized experiences in real time. Modernized applications can provide faster response times, seamless user interfaces, and self-service capabilities that can lead to higher customer satisfaction and loyalty. And companies can also leverage the insights they gain from smarter applications to make data-driven decisions and drive further innovation.

At the same time, there are technological benefits to modernization that are important to consider just as there are business benefits to be gained. Technology investments generally ladder up to business objectives, which is essential for getting approval for technology investments. By clearly linking technology investments to business objectives, you can get buy-in for what will be a substantial overhaul, depending on the extent of legacy debt you're dealing with. Keeping a laser focus on what's driving you to modernize is essential while planning a modernization effort and making progress on your journey. Analyst and research firm TDWI surveyed tech leaders, developers, data scientists and analysts, and solutions architects to find out their key considerations for modernizing or planning to modernize. Some of those findings are included here in the list of the top business drivers for modernization.

Top Business Drivers of Modernization	
Increase operational efficiency and effectiveness	Maximizing operational efficiency and effectiveness through technology investments like cloud-based software and automation allows an organization to focus on creating and delivering high quality products and services.
Generate new business strategies and models using analytics	Analytics have empowered businesses to make smarter, data-driven decisions and generate new opportunities by leveraging insights about shopping habits, pricing strategies, and how to expand into new markets.
Support faster (including automated) decision-making	Speed is a competitive advantage, and businesses that can make swift and well-informed decisions are better positioned to capitalize on opportunities and navigate challenges effectively.
Mitigate business risks; enable smarter fraud and anomaly detection	Swift identification of irregularities through advanced technologies not only prevents financial losses but also preserves brand reputation, customer loyalty, and overall operational integrity in today's dynamic business landscape.
Sharpen financial management, planning, and forecasting	Data-driven financial management, planning, and forecasting provides clarity on resource allocation and enables businesses to adapt, invest wisely, and seize growth opportunities while ensuring long-term stability and profitability.
Reduce IT and data management costs	Trimming IT and data management costs frees up resources for innovation and growth while ensuring streamlined operations and enabling businesses to allocate funds judiciously and enhance overall competitiveness.
Drive smarter marketing, sales, engagement, and support	Today's businesses need to foster deeper customer connections to improve brand loyalty, retention, and revenue growth. Data-driven insights enable better targeting, tailored offerings, and optimized sales processes.
Observe and enhance customer experiences across channels	Consistent interactions across channels create positive impressions and show that businesses can serve customers holistically. Insights gained across channels enable targeted marketing that drives revenue growth.
Improve regulatory reporting and adherence	Accurate and timely reporting demonstrates transparency, builds trust with stakeholders and regulators, and avoids costly penalties and reputational damage. It also fosters a culture of accountability, promoting ethical conduct and responsible business practices.
Improve online and social commerce through real-time analytics and AI/ML	Modern systems powered by real-time analytics and AI/ML can provide deep insights into customer behaviors and preferences, improve inventory management and demand forecasting, and help optimize pricing and promotions for maximum impact.

Modernizing the technology stack is a prerequisite for achieving long-term, sustainable competitive advantage through modernization. But what is it that's holding innovation back? And more importantly, what are the technology solutions that can unlock innovation for businesses and help them achieve the benefits of a truly modern IT infrastructure? Here are some of the top technology drivers of modernization, including some of the key capabilities businesses seek in order to achieve their overarching strategic goals. Note that some business benefits overlap with technology benefits. That's because the benefit is so universal that competency at a micro level scales up to a macro level. Security is one example; secure systems ladder up to secure behaviors, secure businesses, and less risk at all levels.

Top Technology Drivers of Modernization	
Efficiency	Modernization improves operational efficiency by automating manual processes, streamlining workflows, reducing human error, and boosting productivity.
Cost savings	Aging IT systems need a lot of maintenance and support, which can be costly. Modernizing can reduce maintenance expenses, optimize resource allocation, and eliminate or reduce hardware and software license fees.
Scalability	Cloud modernization enables organizations to easily expand their infrastructure and handle increased workloads without significant upfront investments.
Improved data security	Older IT systems are vulnerable to security threats. Modernization can result in more robust security measures and best practices to protect sensitive data.
Agility and flexibility	Adopt agile development methodologies, embrace DevOps practices, and deploy updates and new features faster, enabling them to stay relevant and competitive in rapidly evolving industries.
Integration	Turn data silos into highly integrated systems, allowing organizations to streamline data flows, unify processes, and enable seamless communication and data sharing across the enterprise.
Compliance	Modern IT systems can help ensure compliance by implementing security measures, audit trails, and data governance frameworks that align with regulatory requirements.
Future readiness	Adopt emerging technologies – Internet of Things (IoT), Generative AI, ML, and edge computing – as they become more prevalent and impactful, enabling them to capitalize on new opportunities.
Microservices architecture	A microservices architecture is more agile and scalable, enabling businesses to develop, deploy, and update individual components independently, accelerating innovation. It's a modular approach that enhances fault isolation and resource efficiency, leading to improved system resilience and optimized resource allocation.
Developer experience	Developers are more productive, creative, and collaborative when given smooth workflows, intuitive tools, and a supportive environment that allows them to focus on coding, iteration, and problem-solving.

Refactoring your legacy system for a modernized architecture requires more than just a few strategic IT investments. It requires maintaining a culture that embraces agility in order to adapt and thrive in a fast-paced, ever-shifting landscape of opportunities and innovations. By leveraging people, processes, and technology, businesses can create an advantage that propels them towards success more quickly and efficiently, while also minimizing costs and risks. By becoming an agile organization, companies can implement drastic changes to their development teams and processes, which will ultimately result in more speed and reliability, allowing them to build business functionality faster, scale to millions of users, and cut costs. We often refer to the presence of inflexible and outdated legacy systems as technical debt, but often the larger problem to overcome when embarking on a modernization project is legacy mindset, which requires overcoming some amount of organizational debt and embracing a change mindset.

Why Modernization Really Stalls

Research has shown that close to 70% of transformation initiatives are either slowed or completely stalled. A major cause of failure is the human factor. Although modernization may seem like a technology problem to solve, the real reason why modernization projects stall or fail is not because of technology but rather change management. After all, when looked at dispassionately as a set of prioritized steps and processes, it appears that change management should be merely an execution challenge, albeit a complicated one. Instead, what we have observed is that transformation rarely happens as the linear process our technical training would have predicted.

Modernization is often, for good reason, an iterative process with incremental progress in its early stages. Transformation takes time and patience if you hope to optimize outcomes and de-risk your modernization. It takes years for legacy debt to accumulate. On top of the tangled web of outdated technology, lack of documentation, and interdependencies that are slowing or preventing new integrations, there's a legacy process to overcome with antiquated ways of doing things.

When starting a modernization effort, companies often target a siloed part of the value chain or a small, technical piece of the larger puzzle, such as a new search engine. Successful modernizations start with re-thinking the value chain, business process, or customer experience, and by asking questions like, "How do we deliver a new, better search experience?" You can then work backwards to understand the implications for your tech stack and data.

Another common pitfall when embarking on a modernization effort is building teams that reflect the siloed nature of the organizational structure. Instead of forming small, cross-functional squads that can make fast decisions, iterate quickly, and get approvals, the organization forms a centralized, siloed team where approvals take longer. Some organizations simply lack the skills to shepherd a modernization project across the finish line. This may require additionally upleveling or onboarding of skills, or a partner or professional services engagement.
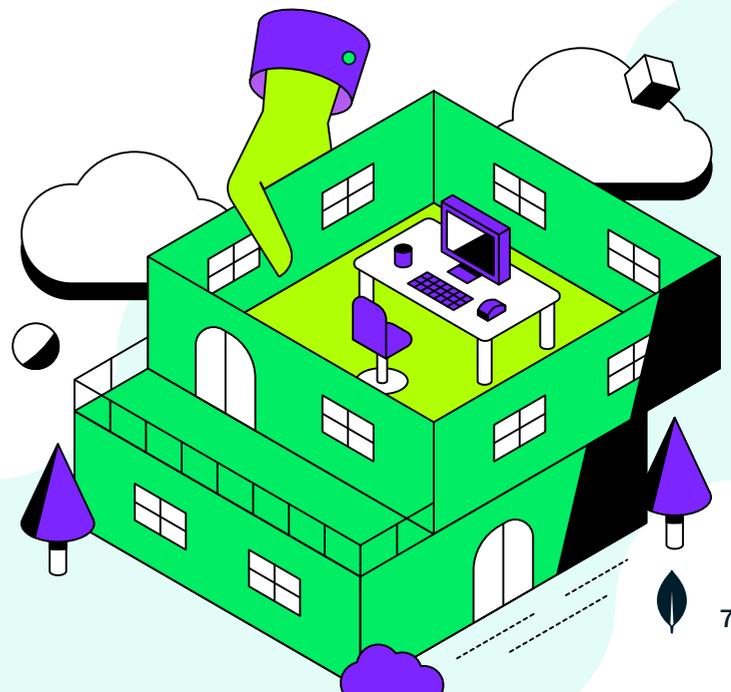
And finally there's the legacy mindset, which is characterized by distrust of disruptive technologies, an overreliance on niche legacy technologies, and stubborn beliefs about cloud security vs. on-premises. When businesses rely too much on niche technologies, it slows innovation, entrenches businesses on inflexible legacy systems, and makes modernization a political football. Forward-looking practitioners know there are better ways of doing things, so expertise in niche technologies is a declining, scarce, and potentially costly resource.

Modernization happens when bold decisions are made by a strong champion or team of strong advocates. Their goal is to challenge the establishment within their organization and confidently counter resistance to change with a forward-looking vision that's rooted in the drivers of modernization. Care must be taken to address slow-walking the project at key junctures and half-hearted attempts at modernization, like focusing on surface changes and simply reskinning or replacing the UI, which will not deliver the advantages of a true modernization. Rigid architectures need to be replaced by flexible ones, not simply SaaS versions of legacy relics.

Best Practices for Overcoming Modernization Pitfalls

Without visionary leadership and a growth culture, a lack of confidence sets in that manifests itself in the belief that modernization can never happen. Often, they need to see it to believe it. Signs of progress along the journey can help. By undertaking modernization through an iterative approach, you can start to see some signs of progress and score some early wins, which can serve the larger purpose of driving the migration forward and instilling confidence that it can and will happen.

Lift and Shift vs. Rip and Replace

One of the key early decisions is whether to lift and shift an on-premises system to the cloud or undertake a more transformational approach known as rip and replace. This is where the entire legacy system is scrapped and a new architecture gets deployed in the cloud, resulting in a more comprehensive digital transformation.

Lift and shift is often seen as an easier and more predictable path, with less business risk and organizational resistance. But for your most critical applications, it rarely achieves the transformational changes that are driving businesses to modernize today. You won't likely be able to fully exploit new capabilities that enable your business to build, test, learn, and adapt faster.

There's a common belief that the lift and shift approach will deliver the benefits of

modernization more cost effectively. But in our experience, it's rarely a more cost-effective approach for a few reasons:

1. Your existing applications are often not automated or elastic. As a result, they end up overprovisioned to accommodate high seasonal loads or transient usage spikes – just as they were in your on-premises installation.

2. You don't get the agility benefits that come from new engineering processes enabled by the cloud – instead change is only made after tickets are bounced between teams, again just like your on-premises systems.

3. You do not get the ability to use higher level managed cloud services that remove the need for infrastructure and operational management.

Keep in mind that every application is different, and there's no single right answer in choosing lift and shift versus a complete transformation. In some cases, lift and shift can be a first step that helps your teams gain familiarity with a modernized system before embarking on a fuller transformation. However this can also be a risk if your teams believe they are done in your cloud journey and don't progress beyond that first step.

The truth is that data size, interconnection, liveness, provenance, and regulation make it extremely challenging to move an application and its attendant data. This is one of the reasons why some companies choose to completely lift and shift their entire application and data estate to the cloud unchanged. But in many cases, cloud vendors don't offer equivalent systems in their hosted environments. After working with thousands of customers over the last decade, our opinion is that complete lift and shift is not actually possible.

On-premises infrastructure has many assumptions built into it; monitoring and alerting frameworks, deployment tools, and size and speed of machines. There is no cloud available that completely emulates the underlying systems in your data center, nor do any of the clouds have all the features of your bespoke on-premises systems, which you have built up over years or decades. Lifting and shifting your applications and data en-masse versus transformation is a false choice. As the leader of your company's move to the cloud, you must gather the right data, make the right decisions, and actively choose the amount of transformation you can and should accept, both overall and on an application-by-application basis.

A Phased Approach to Migration

Of course there are pros and cons to different approaches, and sometimes the best path is to strike a balance between two different approaches. By taking a phased approach to modernization, you can balance the risks, and in many cases mitigate them, while making incremental progress toward the larger goal. A phased approach blends the predictability of the lift-and-shift approach with a path to fuller transformation as your teams' skills and capabilities grow, and as business cases are solidified. A phased approach also enables you to make incremental steps to a fuller transformation, and you can begin to accelerate and exploit cloud-native features while paring down technical debt.

Digital transformations are often delayed by setbacks such as mistaken expectations, surprises in technical complexity, or cost overruns. In addition, the lack of alignment with stakeholders on both the likelihood of these events and how to pivot can cause the failure of the initiative. We've helped thousands of customers manage these transformational initiatives and we've broken down what has worked for them into a series of positive steps every transformational leader can take to prepare and guide his team through a successful modernization initiative.

The first step is aligning your vision of the future around shared business goals with all stakeholders affected by the change. Focusing on the value the cloud brings is key, with examples including:

- Faster cycle times for new digital initiatives that will generate new revenue streams
- Improving operational efficiencies, with costs tightly aligned to usage
- Reducing "regrettable spend" in maintaining aging data centers and dealing with pernicious enterprise software licensing audits
- Paring down technical debt accrued by on-premises infrastructure

The next critical step is setting realistic and explicit expectations. Remember, it took years for legacy debt to accumulate. It won't be transformed in a day. Like remodeling a house where you have to keep living in it during the change, there will be surprises, cost overruns, and it will take time and energy from all stakeholders to succeed.

Also important is setting clear expectations around the product vision and roadmap for your company. You probably already have a long-term product vision for the company, a vision that is unchanged by IT's decision to move the company's infrastructure to the cloud. However, it is likely that as a transformational leader, you will have to negotiate with the business to delay or modify parts of that product vision for the short term at least in order to have a more agile company and product vision for the future.

You also need to set expectations inside of the IT and technical organization, making sure your teams understand that in order to succeed, all processes and tools are fair game for change. In particular, it's important to ask for, and expect, suggestions for modern, service-based, agile systems to change the underlying infrastructure of your applications. This transformation may see old procedural and manual jobs replaced by cloud-based services and automation. Naturally, people who have been with your organization for a long time will be concerned about their place in the new world order of a cloud-based, agile, elastic infrastructure.

Employees who embody a growth mindset will welcome the opportunity to uplevel and update their skills, and good technology leaders will identify and support them. Transformation initiatives are a big opportunity for organizations to get employees to lean into change through training, upskilling, taking on new roles, and reducing cruft in their day-to-day work. Once people buy into change and transformation, the rest is just execution.

Modernization may require bringing in external employees at both high and low levels in your organization. These employees need to be welcomed into the organization and valued for their new skills without causing an adverse reaction that will slow you down. You can help this integration by making sure that everybody

– above and below you – is aligned around clear business objectives that have been agreed by stakeholders and sponsors across the executive team. By doing so, the newcomers can be seen as helpful change agents rather than as dangerous outsiders.

Visionary leaders foster a spirit of experimentation throughout the organization. When your company was new, it experimented – perhaps wildly – to pivot to the successful place you are at now. For new divisions in your company, you probably still do. The challenge is to bring that experimentation mindset into your modernization. Assess where your established market and customer expectations will be in 10 years. Then select two to three initiatives that you can execute against in the next six to 12 months that will move you towards meeting those expectations.

For modernization, you need to test many hypotheses about how your products and applications will be received by your customers, and the cloud lets you do that far more easily. These experiments, by definition, will be new to your teams and they won't be experts like they are in their normal roles, which can be unsettling.

At the same time, your executive team expects results. So you have to maintain your standard processes with milestones and regular checkpoints. The way to navigate this apparent conflict is to set the expectation that pivots will occur as a result of experimentation and the surprises they will likely reveal. It is important that pivots are valued for the insights they provide rather than as failures.

To make experimentation real, take advantage of the observability levels you can get in the cloud. Ask your teams to create real-time feedback loops on the effectiveness of products and features they are building. The cloud gives them ways to do this that were just not possible with on-premises systems or old organizational silos.

Modernization Planning

Before you begin migrating any data, the first step is planning your modernization. This is where you determine whether to address the data architecture first, applications first, or follow a blended approach. Each approach to legacy modernization carries its own advantages and complexities.
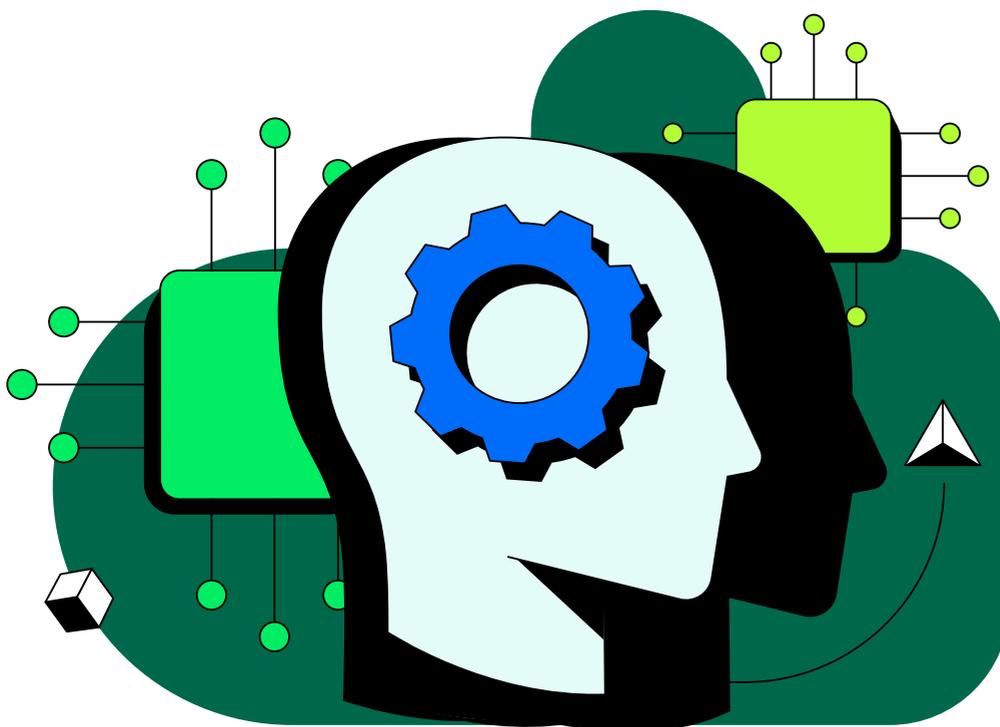
Data-Driven Modernization

A data-driven modernization begins by moving data from the legacy system to the new environment before any applications or microservices are provisioned. Even in its earliest phases, data-driven modernization is a big step forward over legacy systems because once you've moved your first data source into the new environment, you can leverage it immediately and start building modern applications on top of it. Applications can write directly to the new environment without affecting the existing one. Once there are more writes executed in the new environment than the old one, you can begin to dramatically reduce the footprint of the legacy system. By the time the last phases of data-driven modernization are implemented – when the new environment takes over the majority of the work and becomes the system of record – you can begin to retire legacy applications entirely.

Application-Driven Modernization

With application-driven modernization, all reads and writes from new applications are executed in the new data environment from the start. Existing traffic continues to route to the existing data store, and the legacy system continues to operate unchanged. This enables new functionality to be introduced immediately, but it also introduces more complexity. Because application-driven modernization is an all-or-nothing approach, businesses must have a clear strategy for retiring the legacy applications in due course.

Iterative Modernization

Iterative modernization enables organizations to innovate while modernizing. This approach blends data- and application-driven approaches for incremental enhancements, starting with the least complex applications and objects and slowly progressing to more complex ones. With this approach, you can explore iteratively and at your own pace. This one-step-at-a-time approach gives you the best of both worlds: You see immediate gains along the way but are not committing to a newly refactored environment. This minimizes risk while preserving data from the legacy systems.

An iterative approach to modernization involves ranking the different data domains and applications in your stack by complexity, and creating a plan for moving each domain from the legacy system to the new architecture and rerouting applications to connect to the new domains. This assessment is critical because it produces the shared understanding of business impact and project timelines for modernizing any one application. Teams need to understand which applications to modernize, and in what priority and order.

The challenge with assessing legacy applications is that they often have been around for many years if not decades, and built by employees who are likely no longer with the organization. In some cases (such as ERP systems), those applications may not even be managed by the organization itself, and may be contracted out to consulting or managed services organizations. Newer ranks of developers may not even know how to interpret these legacy applications or technologies, or the implications of making changes to them. Nevertheless, the application assessment is a critical phase of the iterative approach to modernization.

Once you've completed the application assessment and before you begin the process of migrating data, you'll need to create a bridge between the new system and the legacy system. In our professional services engagements, we refer to this as the operational data layer, and it serves as the on-ramp for data that's being routed to the new environment. It performs the following functions:

- Centrally integrates and organizes siloed enterprise data
- Makes data available to consuming applications
- Enables legacy modernization and data-as-a-service
- Creates a single source of truth
- Enables real-time analytics and mainframe offload
- Allows for gradual refactoring (vs. rip and replace)
- Minimizes disruption when deploying to the cloud
- Serves legacy data to new applications without straining the legacy system
- Makes data immediately available for analysis and business intelligence

Gradually, more reads and writes are routed to the new environment as the legacy system is retired one step at a time. By the final phase, all applications are provisioned in the new environment.

Creating the bridge between the legacy mainframe and the new architecture enables you to offload traffic away from costly mainframe systems and, eventually, to re-architect monolithic applications into a suite of microservices. Crucially, by deploying the operational data layer in a phased approach, you can embark on your modernization without the risk of an all-or-nothing, rip-and-replace approach. Once the new architecture is in place, development teams can build new business functionality faster and scale new services to millions of users.

Conclusion

The most successful businesses we work with go beyond simply implementing and optimizing modern technologies – they break their value chains down into data domains and treat their data like a product, putting data consumers at the center of their modernization efforts rather than technology and making modernization not only more agile, but effective. This approach is even more critical with the introduction of technologies like generative AI. The most successful organizations will not modernize by introducing generative AI simply for the sake of implementing a new technology; they will have a deep understanding of their data domains and data consumers, and incorporate generative AI in areas where it materially improves their value chains.

Bringing in a professional services team can accelerate and de-risk modernization projects so investments are properly realized in a timely manner. For MongoDB Professional Services engagements, we practice a Jumpstart approach, where we start with transformation workshops to encourage champions to think big with their vision, but act small through iterative phases of technical implementation. We often start with a small prototype or functional MVP using real data or use cases within the organization, build them over the course of a few weeks, and then use that demo to prove to key stakeholders that it can actually be done and get financial or organizational commitment to continue building. These prototypes are also opportunities to see how team members pivot toward (or away from) new ways of working.

We also have tools for accelerating the technical side of a modernization, like MongoDB Relational Migrator, which accelerates projects by tackling the most critical and time-consuming tasks, including SQL query conversion, schema design, and data migration to the cloud. MongoDB Atlas

Generative AI presents an opportunity to accelerate this manual work by automating code analysis, understanding what cloud features are being used, technology or data

interdependencies, and analyzing and developing project plans. The resulting automated scorecards can help teams understand the feasibility and complexity of modernizing every application they oversee, which helps inform their modernization project plans.

Although legacy modernization is frequently perceived to be a time-consuming, complex, and error-prone process, the reality is that legacy modernization can be straightforward, predictable, and successful, allowing businesses to accelerate their digital transformation, deliver truly modern application experiences, and support compliance with increasingly restrictive data privacy regulations, all while minimizing risk.

A critical success factor for any modernization project is the data layer. Traditional legacy databases were not designed for the needs of modern applications. Instead of storing data in fixed rows and columns like relational databases, document databases like MongoDB Atlas use flexible documents that are ideal for addressing the needs of modern applications. The document model's inherent flexibility accelerates time-to-value for the modernization project, which is critical for getting buy-in from higher levels of the organization. It also reduces complexity by using a single platform that natively integrates data and application infrastructure services. With a unified and consistent interface (or API) across all the data and application services in a developer data platform, plus the ability to easily integrate into your development and deployment workflows, it also makes the developer experience far more productive.

Modernization never truly ends. As soon as something is built, it's arguably already legacy. Our goal is to inspire tech leaders that change and modernization are constant, and ideally they design their teams, systems, and processes to be flexible and adaptable so they can react faster and deliver all the benefits of modernization. When leaders embrace this, modernization becomes a predictable and transformative process.