

**Deloitte.**



**Starting your modernization journey**

Update legacy systems with fully automated migration

Fully automated migration uses technology to convert legacy code and data to modern platforms. Once the code has been updated, organizations can tackle modernization initiatives that align with individual business objectives.



## Toward modern applications

IT modernization can be an open-ended journey that promises to streamline process efficiency, improve business performance, and create new ways of serving customers. To get there, organizations will likely need to invest in rearchitecting IT systems and reengineering processes to achieve their strategic vision.

That's an arduous journey for any organization to embark on, but it can be even more difficult for those that rely on aging hardware and legacy software for mission-critical business functions. These old systems are typically incompatible with technology platforms that are essential to digital transformation.

Nonetheless, mainframe applications remain a mainstay of enterprise IT infrastructure, particularly for organizations that rely on high-volume transaction processing. In fact, most large organizations still use legacy applications that run on a mainframe for core business operations. These systems may be antiquated, but they have been fine-tuned over the years to

adeptly deliver heart-of-the business functionality. Consequently, mainframes are likely to stay at the core of IT for the near future.

Similarly, legacy applications are still the crux of many core IT business functions. Some 220 billion lines of COBOL—a coding language that was developed in 1959—are running in production systems around the world.<sup>1</sup> The reason? Vintage code like COBOL, Natural, PL/I, and CA Gen may be outdated, but after decades of customization they often efficiently deliver specific business functionality. And they typically are not easily integrated with today's technologies and modern platforms.

The modernization journey could stall without the ability to transition from legacy technologies. Doing so will enable IT to better integrate essential technologies like cloud services, mobile computing, microservices, and data analytics.

<sup>1</sup>Reuters, COBOL Blues, accessed December 18, 2017

### Charting the right course

There are many paths toward IT modernization, and each organization's course will be guided by its strategic priorities. Many businesses opt to "rip and replace" legacy systems with new system built from the ground up. Others may choose to custom-configure a new commercial off-the-shelf software solution, or transfer technologies, processes, and people from an external provider.

These approaches may have their advantages, but they tend to be costly, risky, time-consuming, and disruptive to the organization. A more efficient option is fully automated migration, which uses technology to convert legacy code and data to modern platforms and allows organizations to incrementally tackle modernization without interrupting business operations.

For two decades, Deloitte has employed a variety of methods to help enterprises modernize applications in ways that strategically address individual business requirements. Based on this experience, we believe that fully automated migration often represents the most expeditious, cost-effective, and low-risk path to modernization.

Deloitte offers a complete end-to-end Application Modernization service, but what differentiates us from others in the market is full automation. Deloitte's Application Modernization powered by innoWake™ suite of products can fully convert all legacy code and data into modern languages. Our fully automated Transformation solution, a component of the suite, preserves the functionality and interface of the existing application while building a foundation for future modernization initiatives.

Fully automated migration also allows organizations to modernize at their own pace. Refactoring a legacy application, for instance, can deliver "quick wins" by reducing potential risks and improving IT efficiencies.

For some businesses, refactoring alone delivers the right results. Others follow a more ambitious modernization course that builds on our refactoring approach to integrate new technologies and platforms.

Regardless of scope, refactoring revitalizes applications in ways that make the most of existing IT technologies while enabling businesses to invest in transformative new digital capabilities. In other words, organizations can enhance IT operations and lower costs while building a modern platform for their future vision.



### What's driving modernization

If there's one overarching driver of application modernization, it's the need for the flexibility and agility required to integrate IT technologies in a way that aligns with business demands. Mainframe-based legacy applications typically are incompatible with today's flexible open-system platforms. As a result, organizations that use antiquated technology are often limited in addressing critical business needs, as well as seizing opportunities for future growth.

Also driving modernization is the high cost of maintaining legacy applications, systems, and infrastructure. Consider, as one example, the U.S. government. In total, federal agencies spent \$94.1 billion on IT in 2017, more than 75% of which was allocated to maintaining aging applications and systems.<sup>2</sup> That doesn't leave a lot of funding for enhancements, expansion of technology capabilities, and IT innovation.

And then there's the shortage of employees skilled in legacy languages like COBOL and Natural. Today, the pool of experienced legacy developers is drying up as Boomers begin to retire in waves, exacerbating the challenges of IT modernization. What's more, most universities no longer offer courses on these legacy coding languages, and younger workers often have little or no experience using them. Together, these factors have tightened demand for legacy developers, who, in turn, typically command higher salaries than developers who work with modern languages.

Not all drivers of application modernization are machine-generated, however. In fact, tech-smart consumers represent one of the most disruptive market forces today. Wielding an array of smartphones and connected devices, they demand anytime, everywhere connectivity to their data and apps. These expectations shape not only their personal lives, but also their attitudes about workplace technology. They expect that on-the-job technologies will be equal to—or better than—what they have at home and in their pockets.

<sup>2</sup>The White House, OMB Budget Fiscal Year 2018, accessed March 1, 2018

# Get to the future fast

Advances in code refactoring have made fully automated migration a mainstay of Deloitte's Transformation solution. Our experience shows that the technology typically provides a faster, more accurate alternative to traditional custom reengineering or use of off-the-shelf software.

Unlike customized systems, which often take several years to demonstrate value, our Transformation solution can deliver measurable benefits in as little as six months, depending on the scope of the project.

In fact, refactoring can speed migration because it typically requires no new definitions of system requirements, and entails minimal end-user training. Modernization can be achieved without code freezes, allowing for ongoing reiterative improvements to legacy applications — with no disruption to operations.



## The scope of refactoring

**User access:** Users access applications with a Web-based browser rather than a terminal.

**Presentation:** User screens retain legacy look and functionality but are based on HTML5 for a rich user interface.

**Logic:** The refactored Java-based solution can run on a variety of platforms, including Linux, Unix, Windows, and Cloud Native. The refactored batch solution can be managed by schedule manager products.

**Interfaces:** The refactored system continues to support legacy interfaces. The refactored functionality also helps reduce the risk of system interruption by precisely replicating the interface functionality and protocols.

**Database:** The refactored solution supports a variety of modern relational database-management systems.

**Deployment:** Organizations can deploy the refactored system on-premise or on the cloud.

## Advantages of fully automated migration

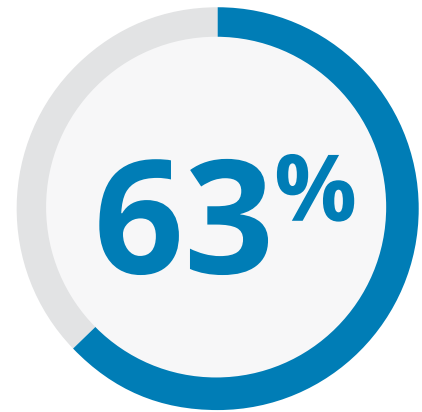


## Legacy coder erosion

Over the past 5 years, businesses have lost an average 23 percent of their mainframe workforce; of those, 63 percent of positions remain unfilled<sup>3</sup>



Lost mainframe workforce



Lost legacy positions unfilled

<sup>3</sup>"Modern Mainframe KPIs Are Key to a Successful Digital Strategy," Forrester Consulting, March 2018

# The mechanics of Transformation

The refactoring and migration process involves three key assets: User interface, business logic, and data. Deloitte's Transformation solution comprises technology and business process tools needed for each step of the refactoring process. Unlike some other solutions providers, we offer end-to-end capabilities that allow clients to interact with a single vendor throughout the project.

One of the first steps is typically Discovery, an assessment that yields a full mapping of the organization's current-state technical landscape. We also rationalize application portfolios and architectures to help plan the best modernization approach. Deloitte supports a range of deployment options, including a phased rollout, a pilot project, or a big-bang approach.

The migration tool converts each line of legacy language to corresponding Java, .NET, or Cloud Native, while preserving the functionality and interfaces of the existing application. We then migrate the legacy database to a database hosted on an open-system platform.

Despite the new environment, the refactored application uses the same system logic, calculation methods, and controls as the legacy system. Consequently, the updated application will interact with data as it did in the legacy system.

Batch migration is an important aspect of any legacy transformation, and our products help streamline the process by executing JCL scripts or transforming them into Bash scripts, similar to how JES works on the mainframe. Our products also retain Batch

tools like SORT, and help reduce risk and complexity.

After migration, all legacy developers typically have been trained in using the refactored code, integrated development environment (IDE), and Batch. Developers can view legacy code alongside the refactored Java and, for most, the Java language will be highly recognizable. (See Example: Transformed code in Java mirrors legacy COBOL code.) What's more, existing Java IT staff can maintain and support the new system, removing the need and expense for specialized legacy staff.

For end users, the refactored application has an updated, Web-enabled look and feel, with functionality that is identical to the legacy system. This results in little to no impact on worker productivity or business operations.

The final step is cutover to the new system. After go-live, the new code base is in a modern language, data structures are normalized, and the user experience displays on Web-enabled screens.

At this point, IT no longer has to support older mainframes, which can save time, resources, and millions of dollars in annual operating costs. Additionally, the updated system is compatible with agile development and DevOps processes, which can help more efficiently support and build out a modern platform.

While there's no standard timeline for Transformation, experience shows that our solution can create value approximately two years faster than alternative modernization methods.

## Transformation accelerators

Deloitte's Transformation solution can help organizations more quickly and efficiently modernize applications through:

### No code freeze

Enables organizations to continue maintaining legacy code throughout the migration project, reducing business disruption.

### Selective deployment

Helps mitigate potential risks by piloting refactored applications with select groups of employees while others continue to use the legacy system.

### Selective refactoring

Helps organizations lower risk and disruption, and enhance project success by refactoring applications (and parts of applications) in a phased approach, rather than a single "big bang" project.

### Deployment location

Possible locations include offshore, onshore, and on-premise, which enables Deloitte to meet an organization's specific security and privacy requirements.

### Delivery timeline guarantee

Deloitte offers timeline guarantees to help quickly create value.

### Example: Transformed code in Java mirrors legacy COBOL code.

COBOL	➔	Java
<pre> MOVE DB2-NR-1 TO CICS-NR-1 SET INIT TO TRUE INITIALIZE HGSS054-PERSON  PERFORM Z81-INITIALIZATION  IF NOT HGSS052-ECHANNEL MOVE K5-ERROR-CODE TO CICS-ERROR-NR                     </pre>		<pre> move DB2_NR_1, CICS-NR-1; set (INIT, true); initialize(HGSS054-PERSON)  perform ("Z81_INITIALIZATION");  if (NOT(HGSS052-ECHANNEL)) move K5-ERROR-CODE, CICS-ERROR-NR;                     </pre>

Source: Deloitte Consulting LLP, COBOL code side by side with refactored JAVA code



# It's time to start

Application modernization doesn't happen in a single moment. Instead, it's an incremental process that will vary with each implementation and organization.

Deloitte's Application Modernization team can help define the scope of your Transformation project and create an implementation roadmap based on your priorities. It's a gradual, low-risk approach that focuses on core system improvements rather than reinventing what already works.

Our Application Modernization powered by innoWake™ solution not only converts legacy systems to a contemporary digital platform, but also addresses key areas that can be enhanced after core systems are modernized. Our team will help you support evolving business demands, and enhance and leverage IT investments throughout the project.

From here, organizations are positioned to continue the modernization journey by implementing technologies like cloud, mobility, advanced analytics, and cyber security. It's an iterative approach that enables you to transform your IT ecosystem based on current and future business needs, and build a flexible foundation for future innovation.

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To learn more about Deloitte's Application Modernization solutions, visit:  
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