

The state of application modernization

How enterprises approach legacy application modernization

2024 edition

A Red Hat report



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The idea that applications are at the core of modern business has gained wide acceptance over time. Even so, while emerging technologies and cloud-native approaches have become familiar terms, the reality is that most organizations are still working to modernize their applications, infrastructure, and business to take advantage of new opportunities.

In the 2nd edition of our application modernization report, we expanded our survey to include more respondents and questions, and updated several questions to gain more accurate insight into how organizations are approaching their modernization journeys.

We found that attitudes towards application modernization are positive—most respondents see modernization as essential and believe that they have access to the resources they need to be successful in their efforts (**Finding 1**). And companies are moving ahead with modernization projects: the majority have already completed at least 1 project (**Finding 3**) and, overall, organizations plan to modernize more than half of their applications in the next year (**Finding 2**).

This year, we took a deeper look at the challenges both individuals and organizations face (**Finding 6**). The challenges were interrelated—individuals' concerns with security, integration, and competing priorities could easily be related to the complexity of legacy systems, cited as the top organizational challenge. Even so, organizations are taking action to overcome these barriers with new tools, approaches, and training.

And last but not least, we asked about the role of artificial intelligence (AI) in modernization efforts (**Finding 10**). As it turns out, it's a rather large role, with 78% of organizations using or planning to use AI to support application modernization. Companies are applying AI's strengths in identifying patterns, analyzing data, and automating tasks to enhance both their applications and the modernization process itself.

While there are variations in approaches and priorities, the overall message is clear: modernization continues to be a priority for organizations across regions. Read on to discover 10 key findings from our survey.

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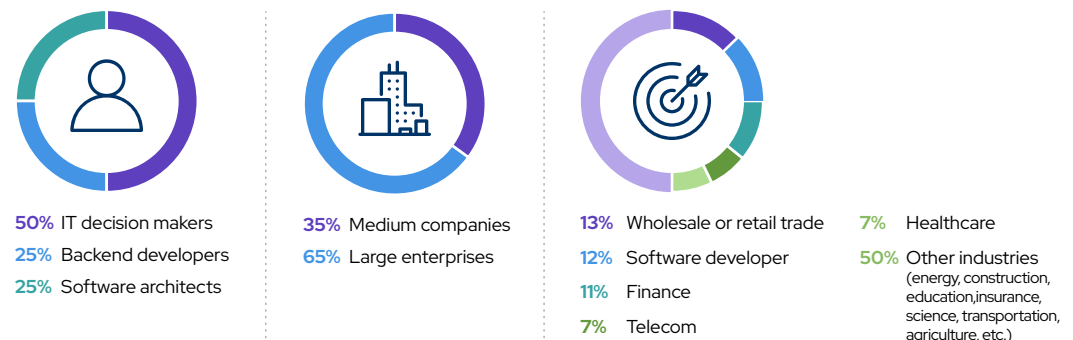
About this report

For the 2nd edition of this report, Red Hat sponsored a survey of 1,000 IT decision makers (ITDMs), backend developers, and software architects in the United States (U.S.), the United Kingdom (U.K.), and the English-speaking Asia Pacific region (APAC) to understand how organizations plan to approach modernization and migration and how they define application modernization success. Data was gathered through 25-minute online and phone interviews with respondents sourced from 3rd-party databases. The survey was conducted in October and November of 2023.

Respondent profile:

- ▶ ITDMs, backend developers, or software architects responsible for their company's application portfolio
- ▶ From companies that have an internal application development team and custom applications that they are modernizing or planning to modernize
- ▶ From companies that currently use or plan to use hybrid cloud or multicloud architectures and containers or Kubernetes

Respondent demographics



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Key findings

Once again, our survey generated a lot of insight into how organizations approach application modernization. Here are the highlights:

- ▶ 95% of respondents believe that **application modernization is essential** for their organization's success.
- ▶ Companies plan to modernize **51% of their custom applications** within the next year.
- ▶ 75% of companies have already completed at least **small-scale modernization projects**, and 18% have progressed all the way to continuous modernization.
- ▶ Application modernization describes **many different initiatives**, including improving continuous integration/continuous deployment (CI/CD) pipelines and data modernization.
- ▶ **Security, reliability, and scalability** are the most cited reasons to modernize, metrics to measure efforts, and overall benefits of application modernization.
- ▶ Organizations and individuals face interrelated challenges when it comes to modernization, and they're **addressing these challenges** with new tools, application programming interface (API)-driven development, and training.
- ▶ **External partners** will play key roles in 66% of application modernization journeys, either leading in-house teams or directly modernizing applications.
- ▶ Organizations will use **multiple modernization strategies** depending on the application they're modernizing. 85% applications will be modernized using 2 or 3 iterative steps, including rehosting, replatforming, and refactoring.
- ▶ Companies are shifting more budget to modernizing legacy applications, and **business applications** are their top priority.
- ▶ 78% of organizations use or plan to use **artificial intelligence (AI)** to support their application modernization efforts.

Read on to discover more about these findings.

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Finding 1:

Attitudes about application modernization are positive

Nearly all respondents believe modernization is essential and that they have the resources and tools needed to be successful.

People are a critical factor in all IT initiatives, and application modernization is no different. In this year's survey, we wanted to find out more about respondents' overall experience with and attitudes toward application modernization. Across both regions and roles, respondents report generally positive experiences. 95% of respondents believe that application modernization is essential for their organization's success. Software architects were more likely to feel strongly that modernization is critical and that they have access to the resources and tools they need to be successful. At the same time, ITDMs value external support from vendors and community forums more highly than other roles. Even so, 95% of respondents across roles do believe they have what they need to support modernization in their role.

Attitudes across regions were fairly consistent with 2 notable differences. APAC respondents reported significantly stronger support from vendors than either U.S. and U.K. companies. These respondents were also more likely to feel that access to community forums for questions and support is critical for their success than U.K. respondents.

Overall, this is good news. Positive attitudes generally mean that staff are on board with application modernization initiatives and have the support they need to move projects forward.

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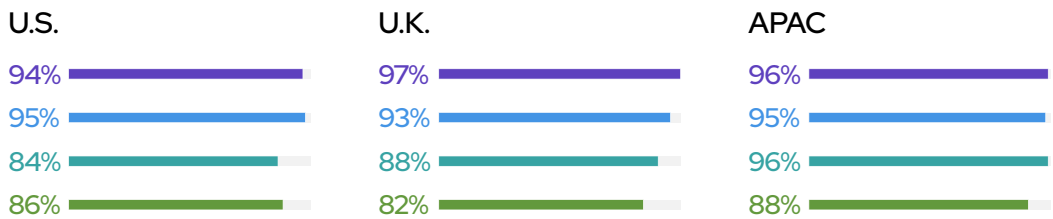
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Application modernization experience by region



Q1a_T2B. How much do you agree with the following statements as they relate to application modernization at your organization?
Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

Percent of respondents choosing "agree" or "strongly agree"

Application modernization experience by role



Legend: IT decision maker (purple), Developer (blue), Software architect (teal), Total (grey)

Q1a_T2B. How much do you agree with the following statements as they relate to application modernization at your organization?
Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

Percent of respondents choosing "strongly agree"

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Finding 2:

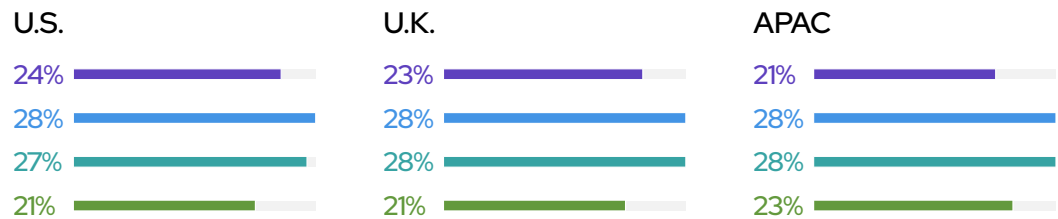
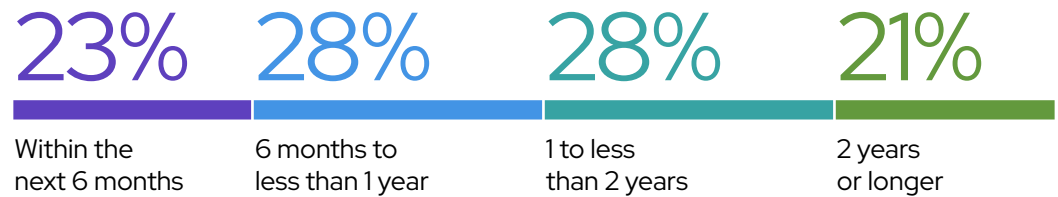
Application modernization continues to move forward

Companies plan for more than half of their custom applications to be modernized within the next year.

Organizations continue to be optimistic about their application modernization timelines, and we didn't see much change from the 2021 results for this question. Companies still aim to modernize more than half (51%) of their custom applications during the next year, and an additional 28% of their applications during the following year. They expect only 21% of applications to take more than 2 years to modernize.

Timeframe for modernizing custom applications

(Percent of custom applications to be modernized in each timeframe)



Q11. Thinking of all the custom applications your organization plans to modernize, what percent of those custom applications do you expect to have modernized in each of the following time frames? Base sizes: Total = 988, U.S. = 497, U.K. = 244, APAC = 247 (don't know responses excluded from mean scores)

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There was a small shift in short-term expectations: organizations currently plan to modernize 23% of their applications in the coming 6 months, while in 2021 they planned to modernize 27% in the same timeframe. APAC respondents reported an even greater difference, with a drop of 8% from 2021 to 2023.

Of course, actual modernization timelines depend on many factors, including available budget, the type of application, how it was created originally, how it is deployed, and the number and complexity of dependencies it has. The level of modernization needed and the size of an organization's application portfolio also impacts timelines. Accordingly, the decline in the short-term modernization numbers may actually indicate that organizations have completed many of their more straightforward modernization projects and are now moving on to more complicated applications.

Finding 3:

Organizations are building modernization expertise

75% of organizations have already completed at least small-scale modernization projects.

Application modernization is a journey, and organizations tend to progress through several stages on their way to becoming modernization experts. In this year's survey, we wanted to learn more about where organizations were in their modernization life cycles. We found that organizations were fairly evenly split across each phase, from early learning to small-scale, large-scale, and continuous modernization. While 24% of organizations were still in the learning phase, 18% have progressed all the way to continuous modernization. The majority of companies are in the middle life cycle phases, with 30% having completed small-scale projects and another 28% having completed large-scale projects.

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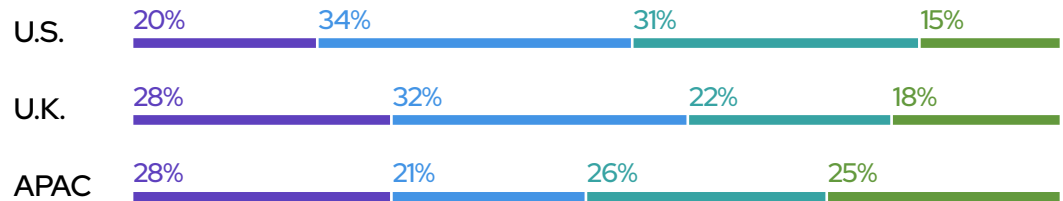
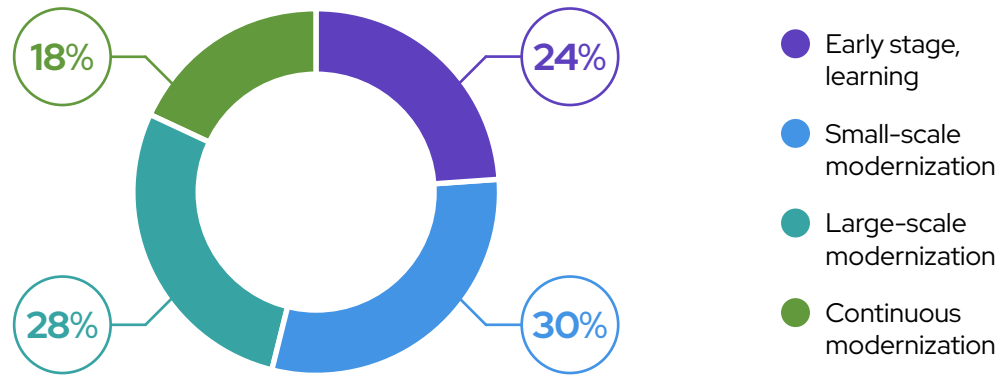
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Modernization life cycle phases



Q2a. How would you rate your organization's maturity in modernizing applications? Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

When we looked at this data in relation to regions, industries, and company size, we found several interesting correlations. Education and wholesale and retail trade organizations, as well as large enterprises, were more likely to be in the learning stages. This isn't surprising, as these organizations likely have legacy applications like supply chain or enterprise resource planning systems that are critical to operations and would require careful planning to modernize. We often hear from similar organizations that they plan to continue running some critical legacy applications until they no longer work, and then move to a new cloud-native replacement, rather than modernizing the legacy application. Meanwhile, U.S. and finance companies were more likely to be in the middle phases of modernization, and APAC and software development companies were more likely to have implemented continuous modernization.

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Finally, we discovered that the further along organizations are in their modernization journey, the more likely they are to:

- ▶ Have hybrid or multicloud infrastructure.
- ▶ Use containers and Kubernetes.
- ▶ Associate modernization with automation and virtualization.
- ▶ Develop applications in-house.
- ▶ Already be building cloud-enabled and cloud-native applications.
- ▶ Experience greater benefits from modernization efforts.

Finding 4:

Modernization means many different things

Application modernization is strongly associated with improving CI/CD pipelines and data modernization.

The term *modernization* continues to describe many different initiatives and actions, so we asked respondents how they define application modernization again this year. Most respondents—across regions, roles, and modernization stages—associate application modernization with improving continuous integration/continuous deployment (CI/CD) pipelines (68%) and data modernization (66%). This makes sense, as CI/CD pipelines play a key role in speeding development and deployment of the applications and services that organizations rely on to stay competitive. Pipelines are fundamental technologies, and organizations continue to add new capabilities to them. Organizations are also preparing to adopt artificial intelligence and machine learning (AI/ML) technologies, which require significant investments in data infrastructure, tools, and practices.

Application modernization definitions

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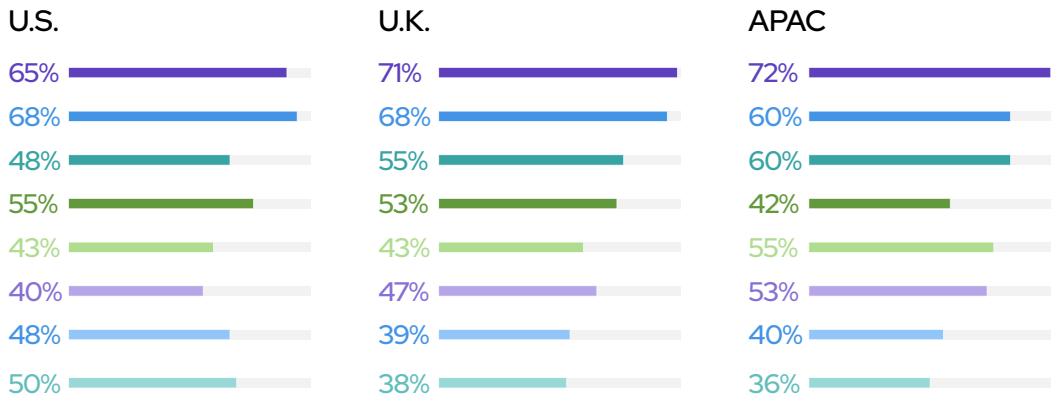
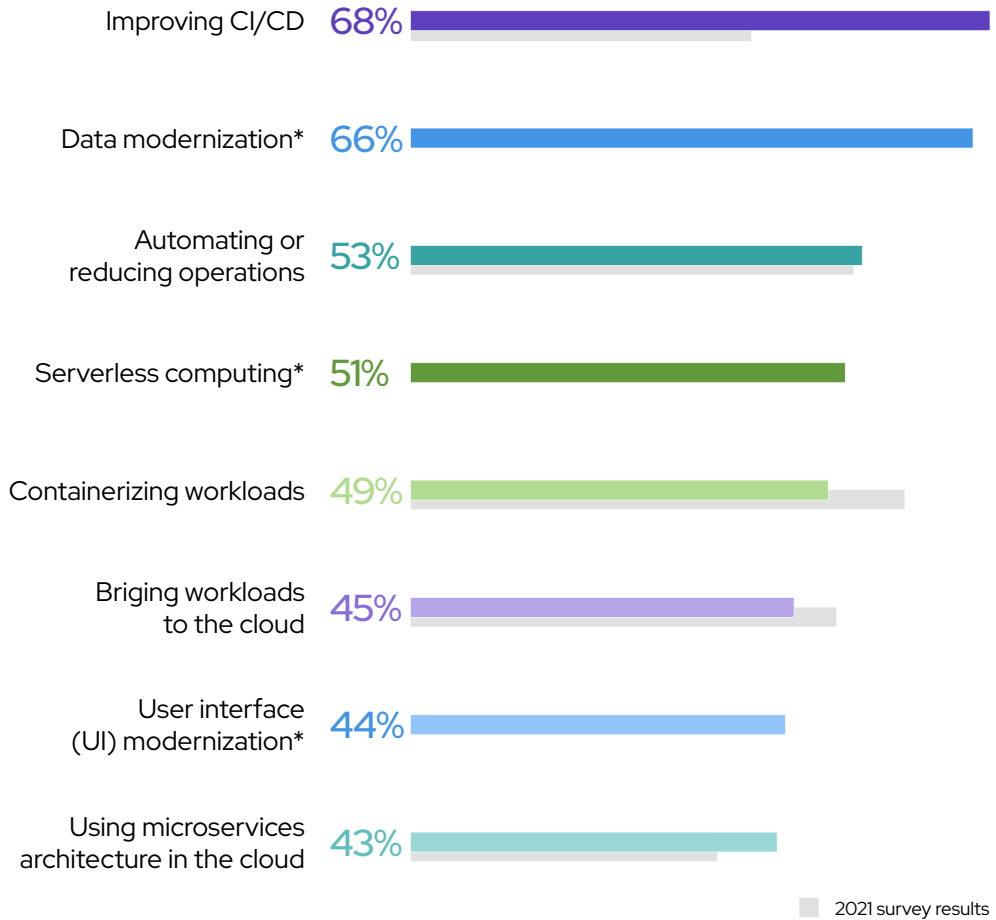
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Q1. What does modernizing applications mean to you? Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

*New attributes added in 2023, no trend available.

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It was also interesting to see how the characteristics changed across regions. U.S. organizations focused more on the use of microservices architectures and user interface modernization than any other region. At the same time, both U.S. and U.K. respondents selected data modernization and serverless computing more often than APAC respondents. And APAC organizations chose automating operations, containerizing workloads, and bringing workloads to the cloud by a higher margin than U.S. organizations.

Finally, the more experienced application modernization an organization is, the more likely they are to define modernization as automating or reducing operations. While the specifics may vary for each organization, it's clear that modernization is more than a single action or definition.

Finding 5:

Security, reliability, and scalability are primary goals

Companies see security, reliability, and scalability as reasons to modernize, metrics to measure efforts, and overall benefits of application modernization.

The primary reasons organizations choose to modernize—security, reliability, and scalability—are familiar. They appear often in surveys about expected benefits of digital transformation and related initiatives. Nearly all respondents cited these factors as extremely or very important reasons for application modernization within their organization. In fact, more than 70% of organizations use these same 3 factors as key metrics for measuring the success of their modernization efforts, though there is no consensus on the single best indicator of success.

Reasons for modernizing, metrics for measuring success, and benefits experienced from modernization

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Improve security



Increase reliability



Increase scalability



Improve customer experience / satisfaction



Decrease costs



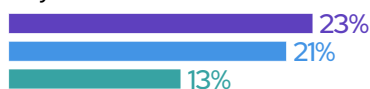
Increase (future) development speed



Increase employee productivity



Pay back technical debt



● Factors in deciding to modernize applications

● Metrics for measuring the success of modernization efforts

● Benefits experienced since deciding to modernize applications

Q2NEW_TB. How important were each of the following factors in your organization's decision to modernize its applications? Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

Q20a. How will your organization measure the success of application modernization? Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

Q20c. Which, if any, of the following benefits has your organization already experienced since deciding to modernize its applications? (asked of those who are currently modernizing) Base sizes: Total = 999, US = 499, UK = 250, APAC = 250

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And organizations are already seeing the benefits of these efforts. More than half of organizations that are currently modernizing have experienced benefits around security (58%), scalability (53%), and reliability (52%). Nearly all organizations (98%) have experienced benefits from modernization have done so in at least 1 of these critical areas. These results clearly show the potential value that application modernization can bring to companies.

There were a few regional differences. U.S. respondents chose increasing future development speed as a reason for modernization more often than other regions. U.K. and APAC respondents ranked security slightly higher than U.S. respondents. Improving customer experience was also a higher priority for APAC respondents.

Even so, each of the options in the survey is interconnected with others. For example, increased reliability, scalability, and security can support improved customer experiences and employee productivity. As a result, the regional differences we see may say more about the roles of individual respondents rather than the overall goals of their organizations. ITDMs may focus on business-level outcomes, while developers and architects may rank more tactical actions higher.

Finding 6:

Companies solve challenges in many different ways

The challenges faced by individuals and organizations are interrelated, and organizations are taking a combination of actions to address barriers.

We asked respondents about 2 sets of challenges related to application modernization: barriers that they personally have faced and obstacles that their organization as a whole has experienced. We found that the challenges faced by individuals were directly related to those faced by their organization.

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For example, each of the top 3 barriers cited by individuals—security concerns (56%), integration challenges (47%), and competing priorities (44%)—can be at least partially caused by complexity in legacy systems, the top organizational challenge. Making changes to complicated legacy applications, especially without a complete understanding of their architecture and existing connections, can easily lead to worries about security gaps and difficulties integrating these applications into modern environments.

Organizations also experienced different challenges depending on which stage of modernization they were in. Overall, the top challenges were complexity of legacy systems (48%), competing priorities (42%), and determining the right approach (41%). However, organizations that were in the early stages of application modernization cited complexity of legacy systems and determining the right approach considerably higher, at 58% and 55%, respectively. And competing priorities was less of a challenge for organizations that have already completed small-scale modernization projects (33%).

Fortunately, companies are taking a variety of actions to address these challenges. Top actions include researching and adopting new tools (51%), adopting application programming interface (API)-driven development (42%), and building business cases for modernization (40%). While more than a third of organizations are also implementing training to solve modernization challenges, another 40% say that additional training is needed. Overall, these actions emphasize advance planning and systematic approaches to overcoming modernization barriers. In fact, a U.S.-based ITDM respondent advised that organizations “set clear objectives and goals for the modernization process, establish a dedicated modernization team, and conduct a comprehensive assessment of your current application portfolio.”

Application modernization challenges faced by individuals

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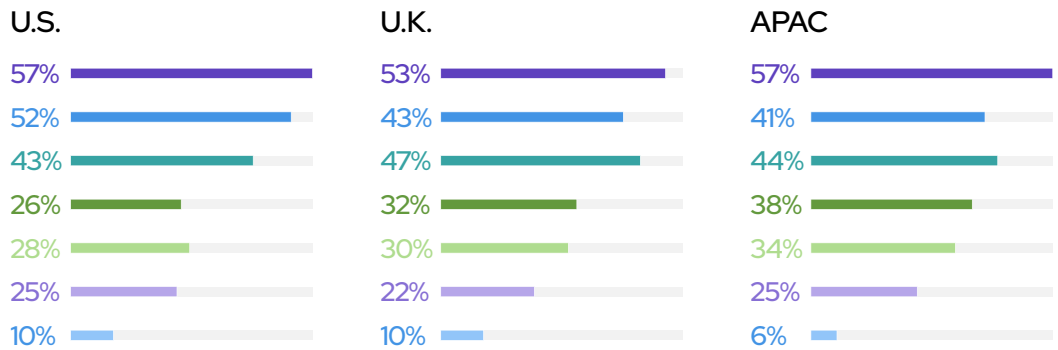
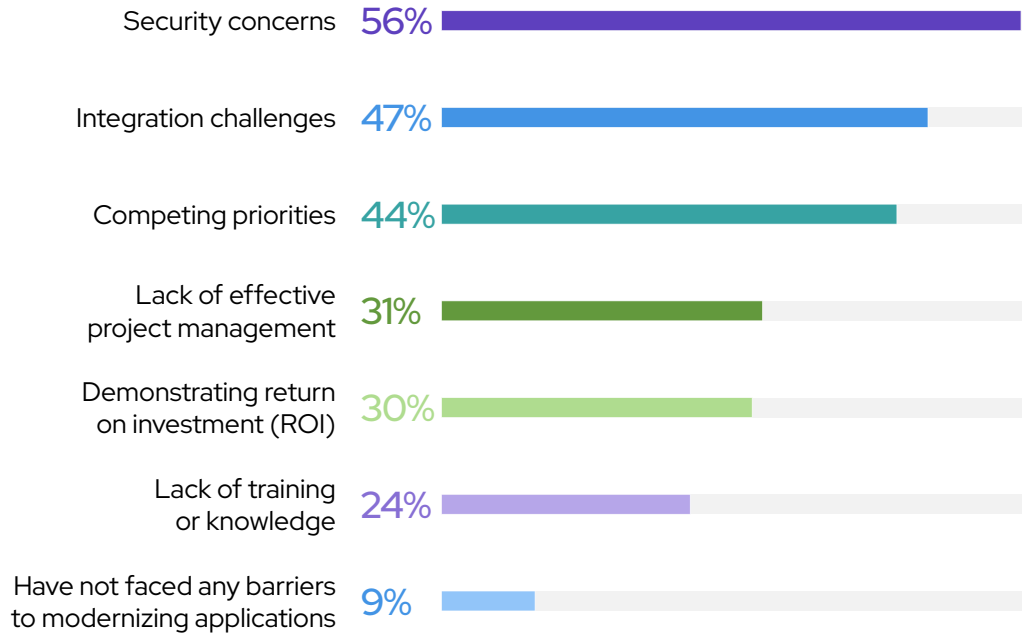
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Q1b. What challenges have you personally experienced related to modernizing applications? Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

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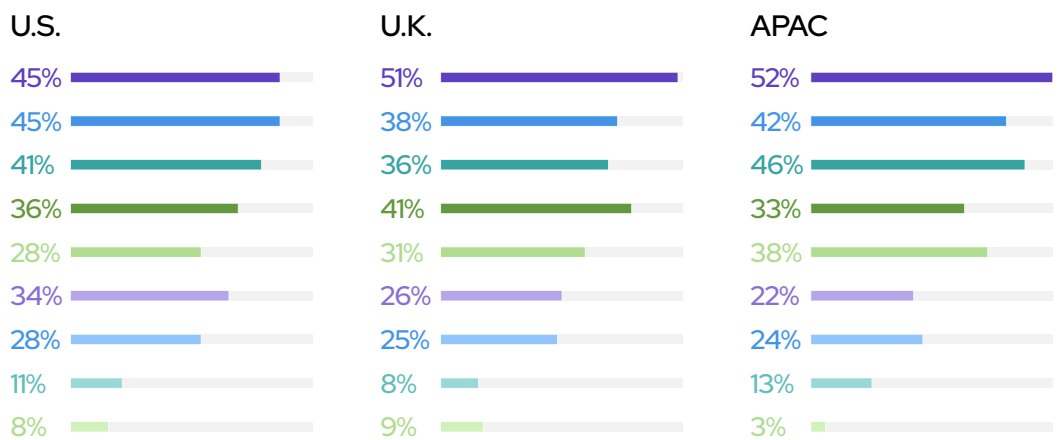
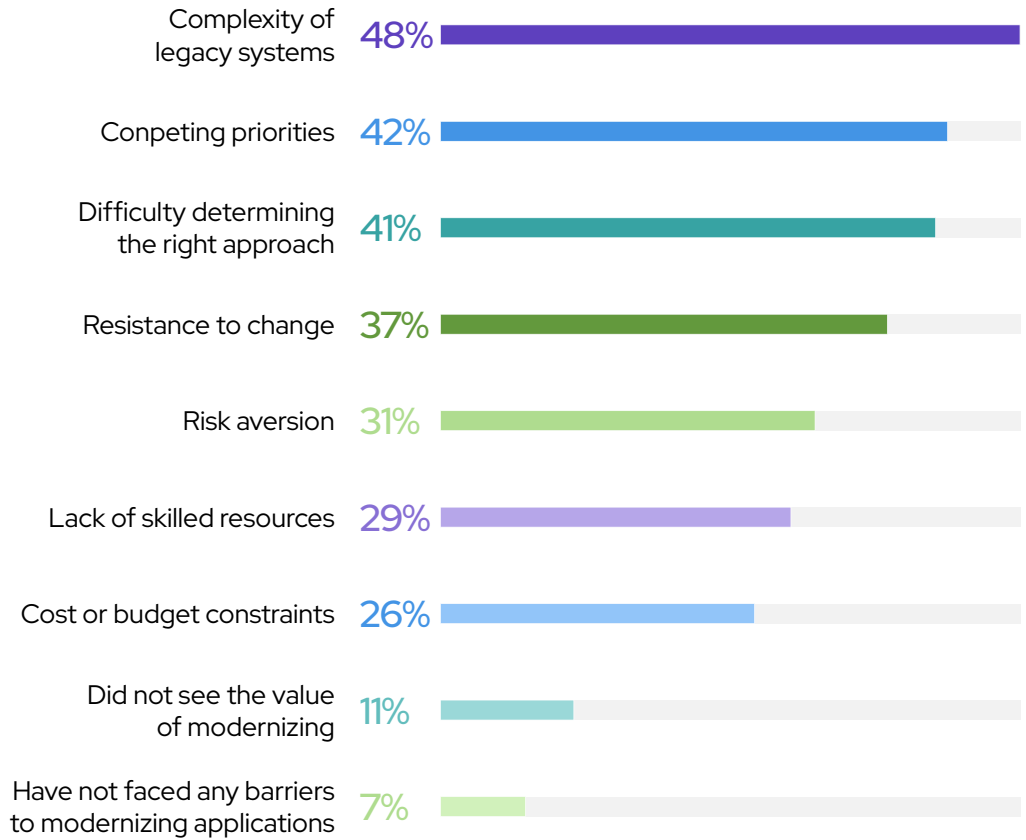
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Q3x4. What challenges has your organization experienced during the process of modernizing its applications? Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

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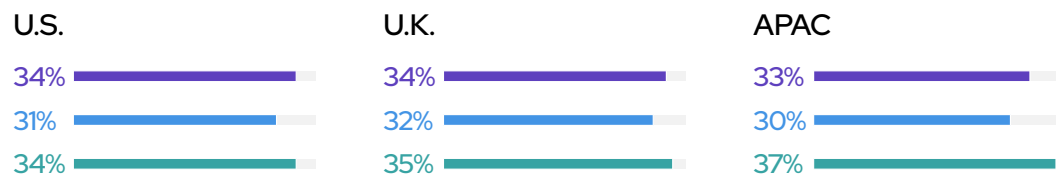
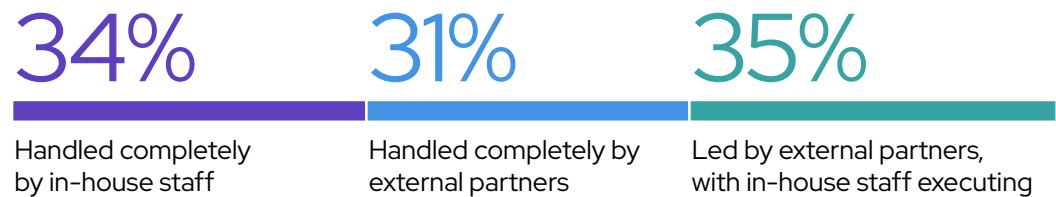
External partners will help with modernization

Respondents expect external partners to be involved with modernizing their applications, either handling the process completely or leading in-house staff.

On average, only 34% of each organization’s applications will be completely modernized by in-house staff. The rest of their application portfolios will either be handled completely by external partners (31%) or modernized by in-house staff led by external partners (35%). The allocation of these approaches changed only slightly from our 2021 survey. We saw a small shift away from modernization led by external partners but executed in-house and toward in-house staff completely handling modernization efforts.

External partner involvement for application modernization

(Percent of custom applications to be modernized by in-house staff versus external partners)



Q14. Thinking of all the custom applications your organization plans to modernize, what percent of them do you plan to have modernized by in-house staff versus external partners? Base sizes: Total = 988, US = 498, UK = 240, APAC = 250 (don't know responses excluded from mean scores)

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These results were consistent across regions as well. APAC companies were somewhat more likely to consult with external partners while executing their modernization actions in-house, but there were no other notable differences.

As partners will be involved in modernizing around 2/3 of organizations' applications, it's important to keep a few things in mind when working with them. First, keep internal teams involved throughout the process. An internal team should own the overall project and provide guidance to partner teams about enterprise constraints and needs. While an external partner can advise how to implement new technology, your internal teams possess the domain knowledge required to make decisions about the best way to use it.

Without an internal counterpart to provide direction, there is a higher risk of external partners building software that cannot be used due to regulatory, operational, or organizational constraints. Partners may also need to spend a considerably greater amount of time learning about your portfolio and ways of working, increasing the cost, risk, and length of the project.

Finding 8:

Companies will use multiple modernization strategies

Modernization strategies are diverse and most commonly involve multiple steps.

When we asked respondents about their modernization strategies last year, we found that organizations planned to use a variety of methods to modernize their legacy applications and that they were selecting the strategy that aligns best to each individual workload, rather than taking a single approach for all workloads. The same trend continues this year, with organizations using varied strategies depending on the specific application being modernized.

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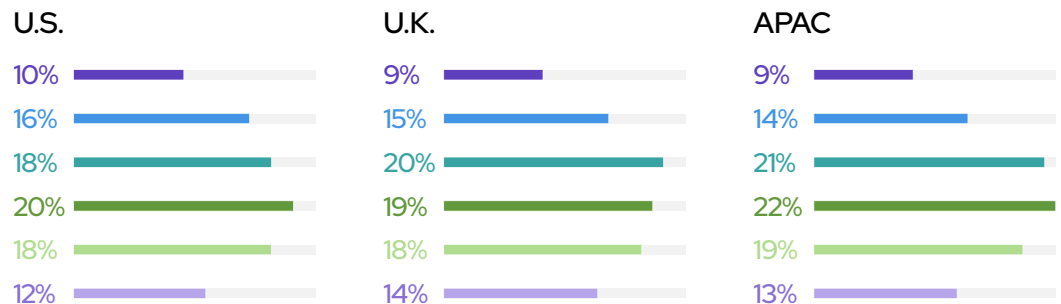
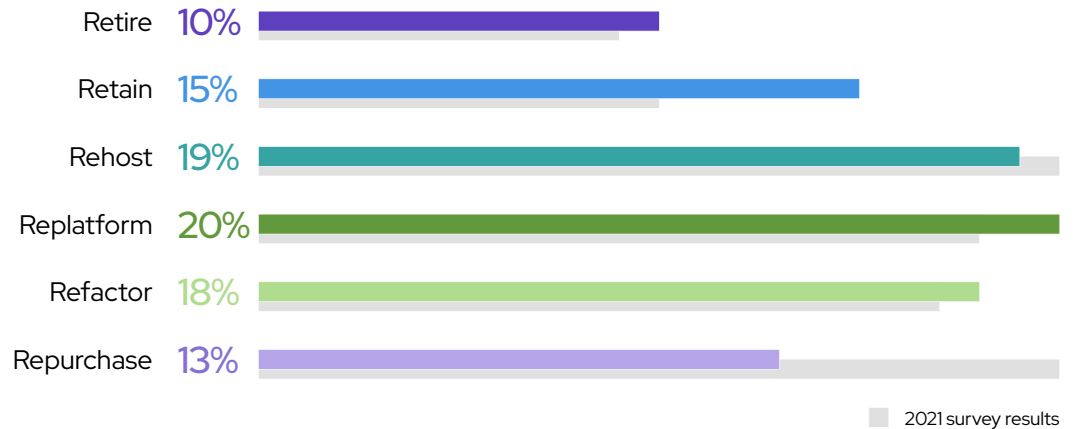
Learn more

As before, we presented survey respondents with 6 choices, the widely used 6Rs:

- ▶ **Retire.** Decommission applications that are no longer needed.
- ▶ **Retain.** Leave critical applications as-is until refactoring is required.
- ▶ **Rehost.** “Lift and shift” applications to a cloud with minimal changes.
- ▶ **Replatform.** Optimize applications to run in a cloud, without changing the core application code or architecture.
- ▶ **Refactor. Rearchitect applications** to be cloud-native by containerizing workloads or moving them to a serverless architecture, for example.
- ▶ **Repurchase.** Move from perpetual application licenses to a Software-as-a-Service (SaaS) model.

Application modernization strategies

(Percent of custom applications to be modernized by each method)



Q10. What does your organization plan to do with the custom production applications it wants to modernize over the next two years?
Base sizes: Total = 987, US = 497, UK = 240, APAC = 250 (don't know responses excluded from mean scores)

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Each of these strategies will be used to some degree, and organizations plan to replatform (20%), rehost (19%), or refactor (18%) more than half of their legacy applications. In this year's survey, we also saw a significant shift away from repurchasing applications—which dropped from 20% in 2021 to 13% in 2023—in favor of other strategies. Overall, these results were more consistent across regions than in 2021 as well.

This year, we also wanted to find out more about the different multistep approaches that organizations were taking towards modernization. Nearly half of organizations (47%) plan to replatform applications before refactoring them. Meanwhile, 38% plan to rehost, then replatform, before finally refactoring applications. And this number increases to 52% among organizations who describe their application modernization as a continuous process. Only 15% of all organizations plan to refactor applications in a single step.

Finding 9:

Business applications are a modernization priority

Organizations are shifting budget to modernization efforts and focusing on core business, data, and analytics applications.

Compared to our last survey, organizations are shifting more of their modernization budget from delivering new infrastructure, cloud services, and modern applications (41% of budget) to modernizing their existing legacy infrastructure and applications (59% of budget). These results were nearly identical across regions. This makes sense, as a shift in budget aligns well with organizations moving forward on their modernization journey to transform more of their applications.

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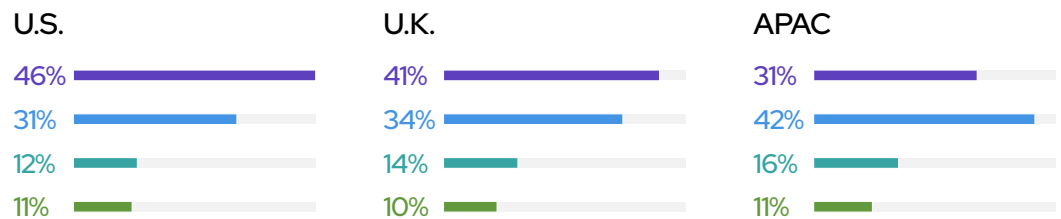
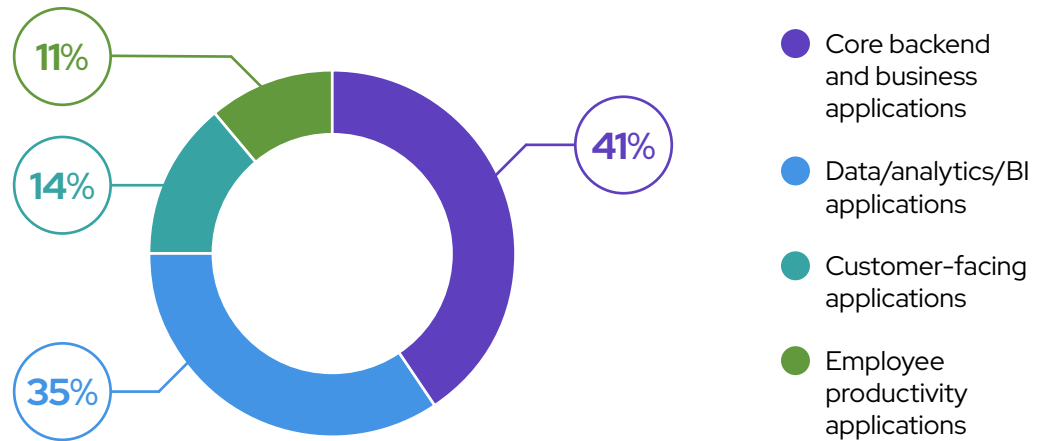
Finding 10:
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We also saw a shift in the types of applications organizations are focusing on. While core backend applications (41%) remained the top priority, data, analytics, and business intelligence (BI) applications (35%) moved into second, replacing customer-facing applications, which dropped from 25% to 14%. Employee productivity applications also declined as a modernization priority, from 19% in 2021 to 11% in 2023.

These results show that companies are focusing on the applications that run their business and the data that informs their business decisions, rather than customer-facing services. While this may seem counterintuitive, it makes sense, as many customer-facing applications likely have either already been modernized or simply developed with more modern or cloud-ready architectures.

Modernization priorities



Q13. Which type of application does your organization plan to modernize first? Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250

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As always, when planning to modernize any critical application, it's important to carefully assess and understand the associated dependencies. For example, core applications often rely upon older, more static systems that may not work well with newer, more dynamic technologies and services. As a result, you may need to consider migrating or modernizing additional systems, data stores, and applications with the target application.

Finding 10:

Artificial intelligence will support modernization

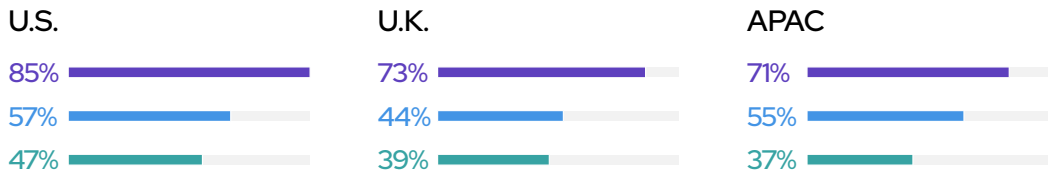
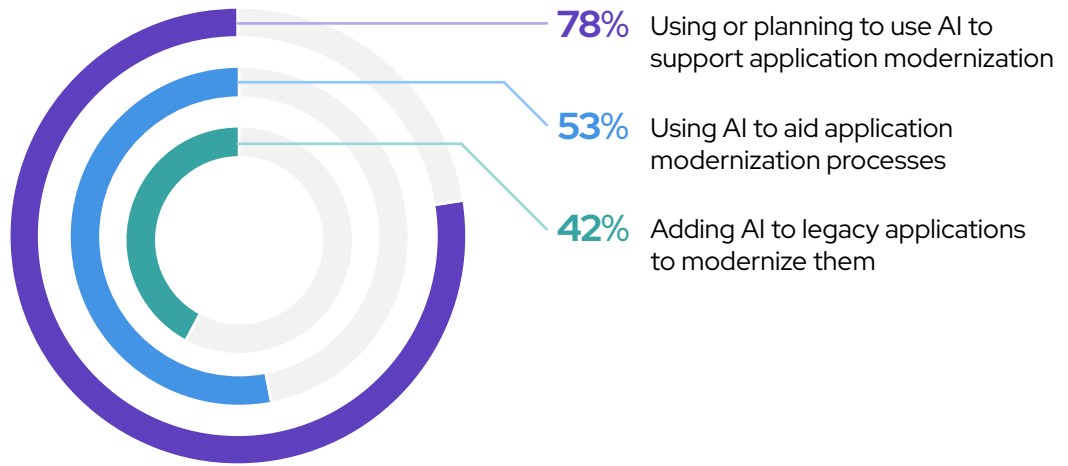
Most organizations are already using artificial intelligence (AI) to support their application modernization processes.

Over the past several years, we've seen organizations adopt AI for an increasing number of use cases. In fact, 63% of companies have AI and machine learning (ML) workloads in place today, and 77% expect to have them in place within the next 2 years. For example, companies currently use AI in IT operations (76%), data analytics and management (66%), and cybersecurity (62%), to name a few.

78% organizations are applying AI to their modernization efforts as well. Overall, 53% of respondents say that their company is using AI to aid application modernization processes, and 42% say that their company is adding AI to legacy applications to modernize them. Only 22% of respondents reported that their organization is not using AI to support modernization.

These results vary a bit across regions. U.S. companies are considerably more likely to add AI to existing legacy applications than any other region. Meanwhile, U.K. respondents said their organization is less likely to use AI to assist in their modernization processes.

AI use within application modernization efforts



Q15a. Is your organization leveraging or planning to leverage AI to support the process of application modernization itself? Base sizes: Total = 1000, US = 500, UK = 250, APAC = 250 (*don't know* responses excluded from mean scores)

Among organizations that are using AI in their modernization efforts, optimizing performance (78%), reducing manual tasks (51%), automating testing (45%), identifying legacy code (41%), and assisting in writing code (31%) are the most common use cases. These results reflect the strengths of AI technologies. AI can identify patterns in application performance, data and network flows, and dependencies to help staff understand what's happening with an application in much less time. It can also help automate a wide variety of tasks and processes. And, as generative AI technologies mature, we expect to see more organizations adopt coding assistance tools to speed development.

These results were fairly consistent across regions, though APAC organizations were more likely to use AI to reduce or eliminate manual tasks than U.S. or U.K. organizations, and U.K. organizations were less likely to use AI to identify legacy code to modernize than other regions.

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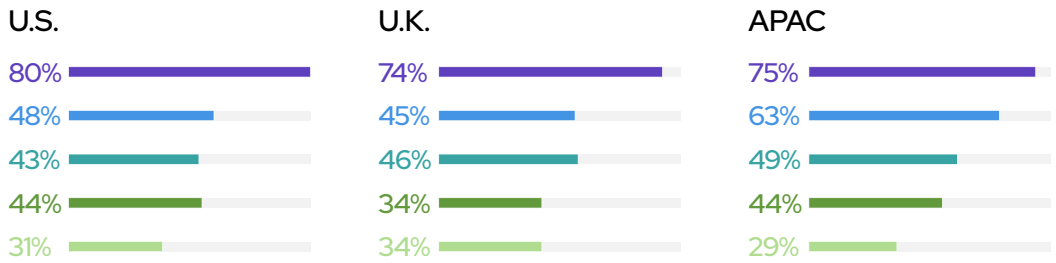
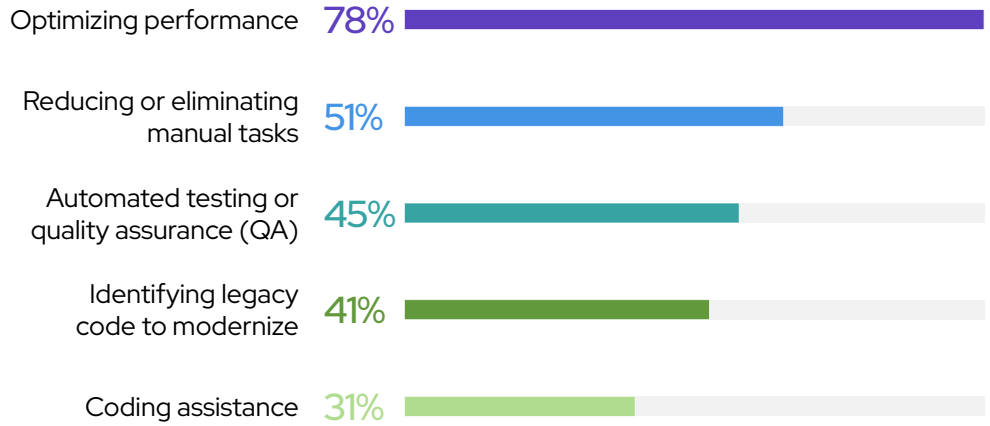
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AI-based tasks within application modernization efforts



Q15b. How is your organization using or planning to use AI for application modernization? (asked of those who are leveraging or planning to leverage AI) Base sizes: Total = 777, US = 425, UK = 175, APAC = 177

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Application modernization is a clear priority for organizations across industries and regions.

Even so, the process can be daunting and requires detailed planning, time, and resources. As a result, application modernization is an ongoing journey for most organizations. Following these best practices can help you modernize more quickly and successfully:

Enlist your leadership

Secure executive sponsorship and project resources with a compelling business case.

- ▶ Blog post: [Make a business case](#)
- ▶ E-book: [Plan your modernization journey](#)

Assess your portfolio

Begin by assessing your application portfolio to find the most impactful opportunities.

- ▶ Blog post: [Define your project scope](#)
- ▶ Online tool: [Modernization assessment](#)

Build your teams

Assemble collaborative project teams and align them to meet your enterprise needs.

- ▶ Blog post: [Build the right project team](#)
- ▶ Tool: [Migration Toolkit for Applications](#)

Educate stakeholders

Provide training, tools, and resources to teams who will use new technologies.

- ▶ Blog post: [Prepare your team](#)
- ▶ Community: [Konveyor](#)

Learn more about planning your application modernization journey.

Start your modernization journey with Red Hat OpenShift

Red Hat® OpenShift® is a trusted, comprehensive, and consistent platform for developing, deploying, and managing applications.

Red Hat OpenShift empowers organizations to innovate with cloud-native practices, accelerate digital transformation, and promote business growth. With flexible deployment and consumption options, Red Hat OpenShift supports a variety of use cases—including application development, AI/ML adoption, edge computing, and IT modernization initiatives—across environments. This comprehensive application platform provides the components, tools, and technologies needed to innovate in today's digital world.

Key Red Hat OpenShift features

- ▶ Developer tools
- ▶ CI/CD pipelines
- ▶ GitOps tools
- ▶ Service mesh
- ▶ Monitoring and logging
- ▶ Cross-cluster application life cycle management
- ▶ Container registry
- ▶ Kubernetes-native security for multicluster governance
- ▶ Software-defined storage for containers

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- ▶ Red Hat OpenShift
- ▶ Red Hat OpenShift AI
- ▶ Red Hat OpenShift Virtualization
- ▶ Red Hat Developer Hub

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Red Hat offers several no cost programs and trials to help you get started today.

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- ▶ Red Hat OpenShift trials
- ▶ Red Hat Level Up OpenShift program, up to 1 year, fully supported, for customers