2021
Mainframe Modernization
Business Barometer Report

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Introduction

Mainframes have been thrust firmly into the spotlight in recent months. From the public sector to enterprises worldwide, the widespread challenges fueled by the global pandemic have driven a greater awareness of the need to accelerate mainframe modernization programs.

Perhaps more than ever before, the government sector has been influential in the greater pursuit to modernize legacy systems and applications. In the US, the Biden administration has emphasized the need to "launch the most ambitious effort ever to modernize and secure federal IT and networks". It has also called for technology workers to help support its modernization efforts by applying for the US Digital Service, an elite technology unit within the Executive Office. Meanwhile, the UK Government recently announced it will "level up" opportunities across all parts of the UK which includes modernizing digital technology in its planning system, which is more than 20 years' old.

All are steps in the right direction for change. And it's not just government organizations that have come to realize that holding off modernization programs is no longer optional.

The 2021 Mainframe Modernization Business Barometer Report – the second of its kind from Advanced – examines the current mainframe market and the challenges facing enterprises worldwide with annual revenues of more than US$1 billion. And, crucially, it explores the impact Covid-19 is having, and will continue to have, on modernization plans.

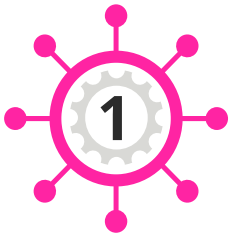
The results demonstrate that, despite a growing appetite from organizations to modernize their mainframes, there are many programs that continue to fail or run into delays due to inadequate planning, poor understanding of the legacy environment and a lack of mainframe modernization expertise. What's more, there have been concerns around finding qualified people who have the right legacy and modern skills – both of which are critical in any modernization program.

Looking ahead, it's clear that enterprises are making a strategic move to the Cloud. It brings countless benefits, including cost savings, automation, flexibility, and scalability. It's also playing a role in helping organizations become more environmentally-conscious and sustainable.

The Highlights

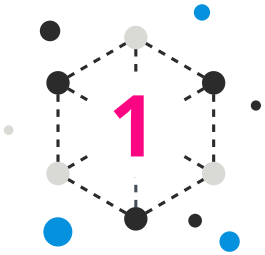
State of Business

55% say legacy modernization has helped their organization accelerate digital transformation efforts



78% of organizations have started at least one modernization program as a result of the pandemic

Modernization Challenges

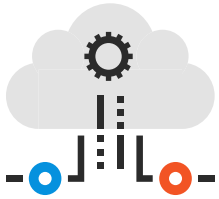


77% have started but failed to complete at least one modernization program

38% blamed a lack of planning for their modernization failures

Sustainability and the Cloud

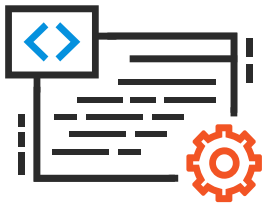
72% of organizations consider their modernization activity as a key part of improving their carbon footprint



33% of organizations see the Cloud as providing improved sustainability

The IT Skills Gap

89% of organizations are concerned about having access to the right IT talent to maintain and manage their legacy systems



36% would take a refactoring approach to modernization mainly because it will help reduce the legacy skills gap

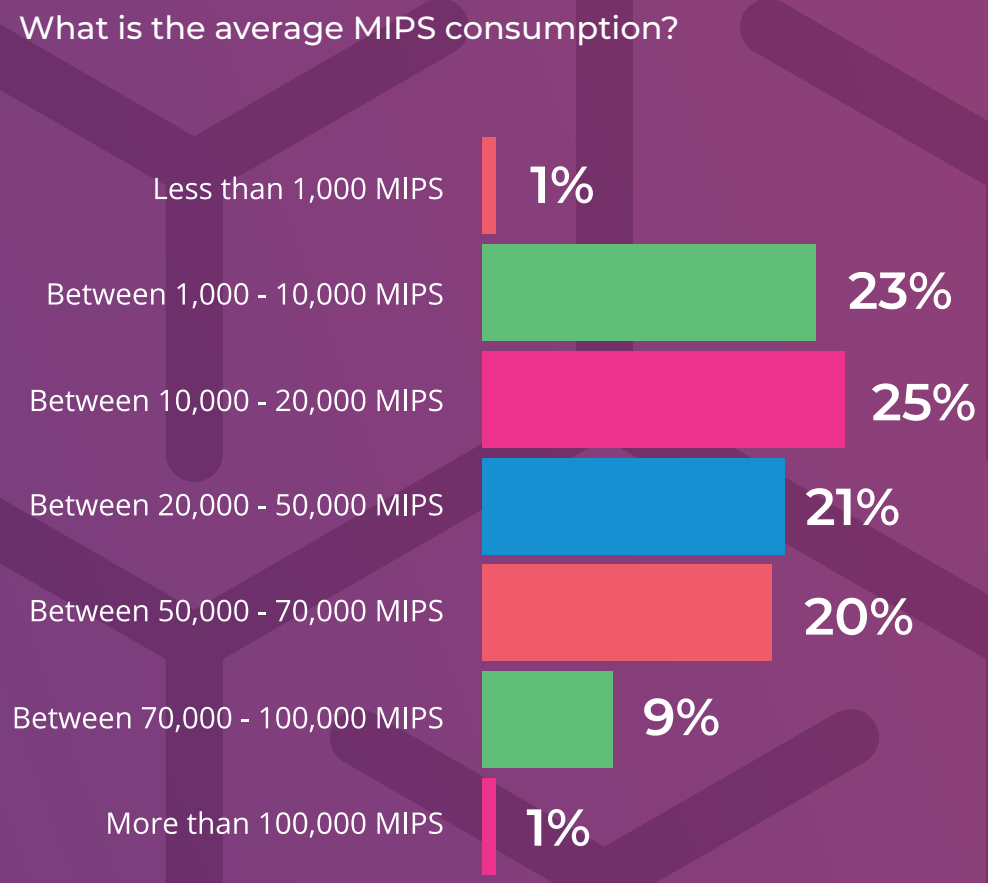
“Modernization is no longer an IT desire, but an operational necessity.”

- Gartner, Impacts of COVID-19 on Government Technology Optimization and Modernization, May 20, 2020 - Neville Cannon, Andrea Di Maio, Michael Brown

State of business

In the last 12 months, organizations have been challenged in more ways than many could have ever imagined. Demands to deploy a global remote workforce appeared overnight, driving an accelerated adoption of technology to support operations. According to McKinsey, digital adoption has taken a quantum leap, with Covid-19 speeding up the digitization of customer interactions and internal operations by several years.

These interactions and operations are largely handled by mission-critical applications running on legacy mainframes – large and powerful machines which are still used by around 70% of Fortune 500 companies today. Our research shows the average enterprise consumes a whopping 33,286 Million Instructions Per Second (MIPS) every month. What's more, they are spending an average of US$4,266 per MIPS annually, factoring in the cost of maintenance, software licensing, hardware, operational, and modernization costs. This equates to an average of US$142 million a year.



State of business

It's clear that organizations continue to depend on mainframes to run mission-critical workloads. Yet, most mainframe applications have been built using decades-old coding languages, which can – and has – led to major disruption. For example, at the start of the pandemic, many state unemployment insurance systems in the US saw an unprecedented wave of claims, crippling the mainframes that supported them and, in many cases, bringing operations to a halt. Even months later in December 2020, nearly 15,000 Vermont citizens received their unemployment checks late due to a technical error caused by their state's mainframes.

Ultimately, dramatic increases in demand have forced enterprises to change how they do business. However, it has meant that some mainframes have buckled because they lack the horizontal scalability that could support a rapid demand in resources.

Developers have been unable to respond fast enough using traditional software development practices with the tools, equipment, and languages that drive these mainframes. In response, enterprises often throw people at the problem, yet still find themselves overwhelmed and gridlocked further down the line.

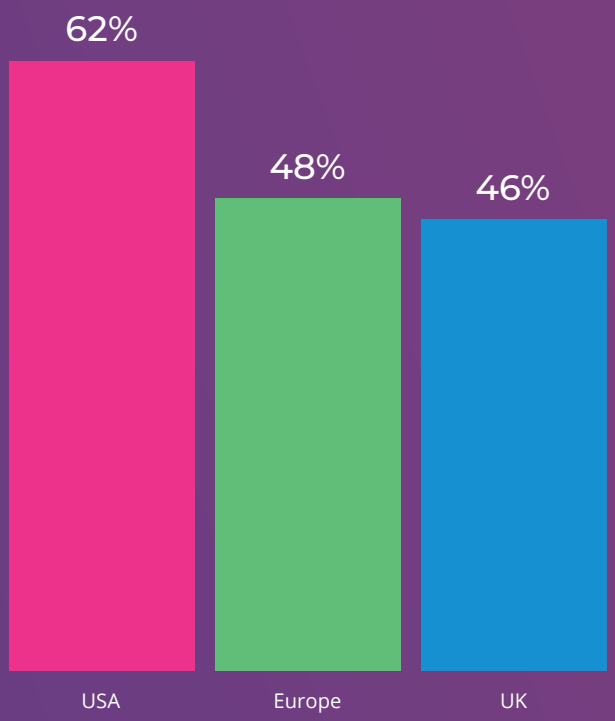
Unfortunately, in the world of mainframes, there is a lack of the type of automation that makes modern practices like DevOps and ecosystems like the Cloud so effective.

The pressure to modernize has therefore been felt worldwide and industry wide. Large organizations not only in government, but in financial services, insurance, healthcare, and logistics, are accelerating their modernization projects. In fact, 78% of enterprises have started at least one modernization program as a direct result of the pandemic, while 60% say Covid-19 has accelerated their Cloud transition process. On average, they are spending US$48 million on modernizing the most urgent elements of their legacy systems.

Some are already feeling the benefits of mainframe modernization. More than half (55%) say legacy modernization has helped the business accelerate their digital transformation efforts, crucial in today's business landscape, while 54% say it has allowed them to be more reactive to market changes – quite a jump from 33% last year.

State of business

What percentage of respondents agree that mainframe modernization has allowed them to be more reactive in the market?



Lastly, the appetite to modernize is here for the long haul. A large majority (87%) of organizations have scheduled at least one legacy system modernization program in the next 12-24 months. Meanwhile, the same McKinsey report cited earlier, found that funding for digital initiatives has increased more than anything else as a direct result of the pandemic.

If there are any positives to take from the pandemic, it's that the crisis has been a pivotal driver of change and the time to modernize is now.

Modernization challenges

Mainframes are complex and old. They have been around for well over half a century and their death has even been predicted as far back as 1996. According to last year's report, 64% of organizations still use mainframe-based applications that are between 10 and 20 years' old. More than a quarter (28%) are between 20 and 30 years' old. And this year's report shows that mainframe-based applications are comprised of an average of 8.86 million lines of code, written in multiple legacy languages across a single environment. Given the size and age of these systems, it's no wonder modernization programs are complex undertakings.

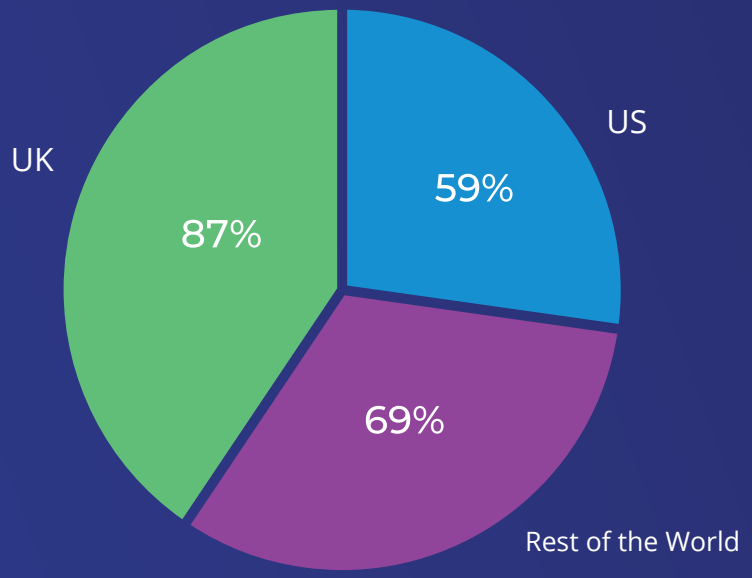
Mainframe applications tend to pass through many hands over many decades, often without proper documentation of features or functional relationships. For many organizations, mainframes are like 'black boxes' – vast entanglements of code written by developers who may have retired or left the business long ago.

Without the right modernization expertise, organizations could find themselves in trouble (you may recall TSB Bank in the UK coming to a standstill after migrating 1.3 billion customer records to a new platform). It's therefore concerning that 36% of organizations consider the legacy modernization programs they have completed, to be failures.

Similarly, 77% have started but failed to complete at least one modernization program, a slight increase from 74% last year. This shoots up to 84% for government organizations and, from a geographical perspective, those in the UK haven't fared well either. 87% of them have started and failed to complete at least one modernization program, compared to 69% of companies in the rest of Europe and 59% in the US.

Modernization challenges

What percentage of organizations have started and failed to complete at least one modernization program?



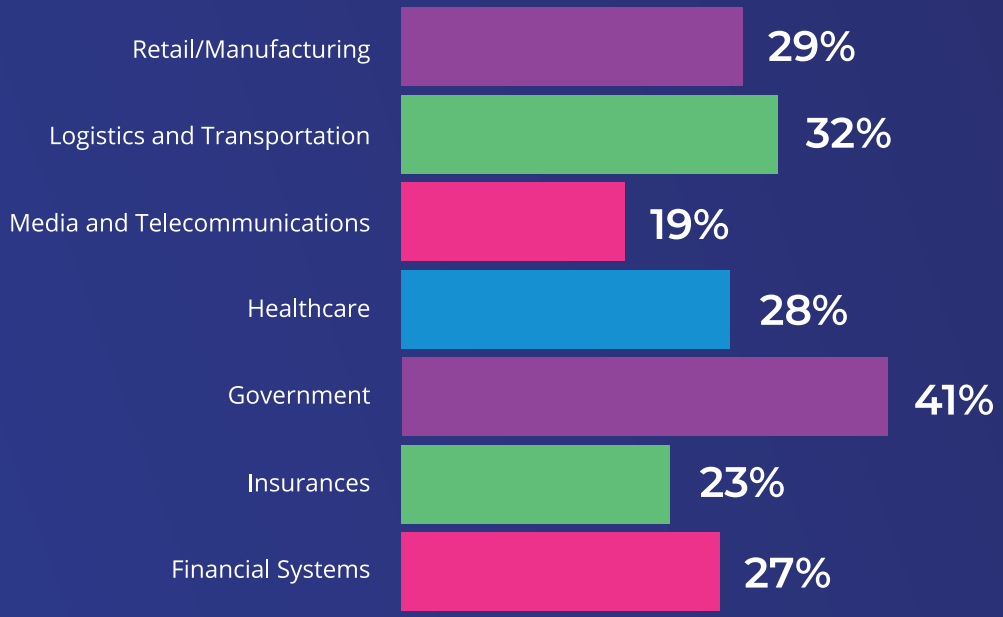
So why are organizations falling short? Modernization programs, in some cases, have been rushed through due to the pandemic and it seems organizations have underestimated the complexity and interconnectedness of these aging giants. These systems demand experienced experts, wielding purpose-built tools, backed by stakeholder buy-in, to successfully modernize. Projects that once took years – or even decades in some cases – to complete, are now truncated into much shorter windows without adequate modernization expertise to meet demands. It's perhaps no surprise that more than a third (38%) of enterprises have blamed a lack of planning for their modernization failures.

It's an important reminder that organizations should consult experienced specialists with domain-specific expertise and demonstrated track records of success to conduct deep assessments and develop air-tight strategies before embarking on any modernization program.

Of course, there have been other challenges, with 33% pointing towards a lack of the right skills (a topic we'll explore later) and 28% attributing their failures to poor information about legacy systems in the business. Interestingly, the latter figure jumps to 41% for government organizations. While the reasons for this stark difference are unclear, one driver could be that government entities are often forced to evaluate and qualify modernization partners based strictly on their adherence to request for pricing (RFP) processes, rather than on demonstrated success or innovative products and services.

Modernization challenges

What percentage of respondents agree that poor information about legacy systems is a key challenge for modernization programs?



It could also be a case of organizations taking on too much at once. One in four (26%) say they have too many time-consuming modernization programs already underway.

The failures could then help explain the lack of buy-in when it comes to starting modernization programs. In fact, 59% of our research respondents admit they have failed to get funding from leadership due to past modernization program failures – compared to a mere 23% according to similar findings last year. Meanwhile, 42% say it's because there is a lack of understanding on why the Cloud offers material advantages over alternatives.

It's perhaps no surprise that only 59% of CIOs and Heads of IT have confidence in their organization's digital transformation strategy, a guiding light for modernization initiatives. It's clear that more work needs to be done to ensure modernization programs not only succeed, but senior leaders see tangible business value in the results. Ensuring these positive outcomes requires organizations to harness experienced modernization specialists to help develop well-defined strategies backed by detailed plans to minimize the risk of failure.


“Mainframe modernization is not on-the-job-training type of work. Seasoned people need to be brought in with proven tools to succeed.”
- Steve Steuart, Global Head of Mainframe Migration & Modernization, Amazon Web Services (AWS)

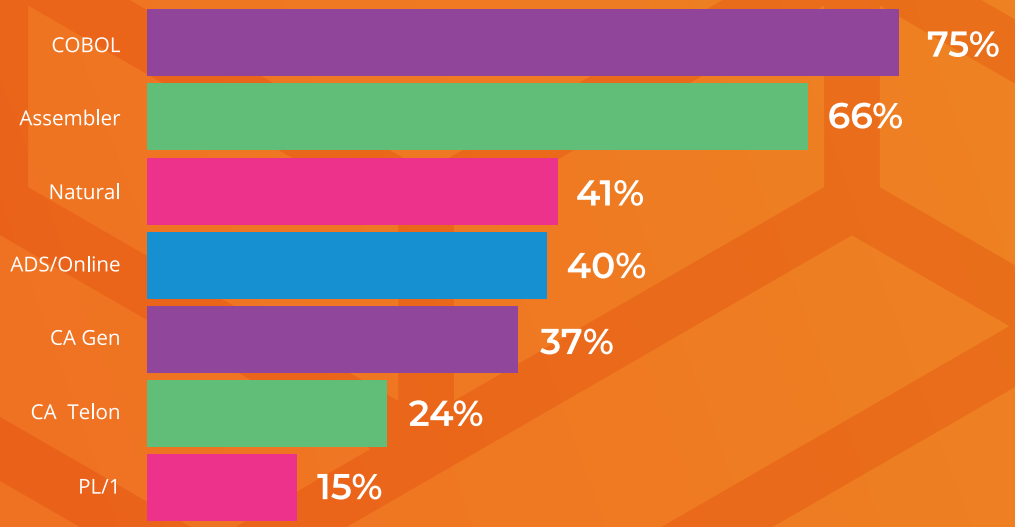
The IT skills gap

The technology sector has long suffered from a skills shortage – and those relying on the upkeep of mainframe feel the pinch the most. Organizations are unable to find the skilled staff needed to maintain and extend these critical systems. As a result, over the last 12 months, we have seen the widespread panic and urgent calls for assistance from developers who understand legacy languages.

Take the State of New Jersey, for example, when hundreds of thousands of residents quickly submitted applications to its unemployment system at the start of the global pandemic. The sudden 1,600% increase in claims overwhelmed the mainframe, resulting in the plea for COBOL programmers from Phil Murphy, the state's Governor.

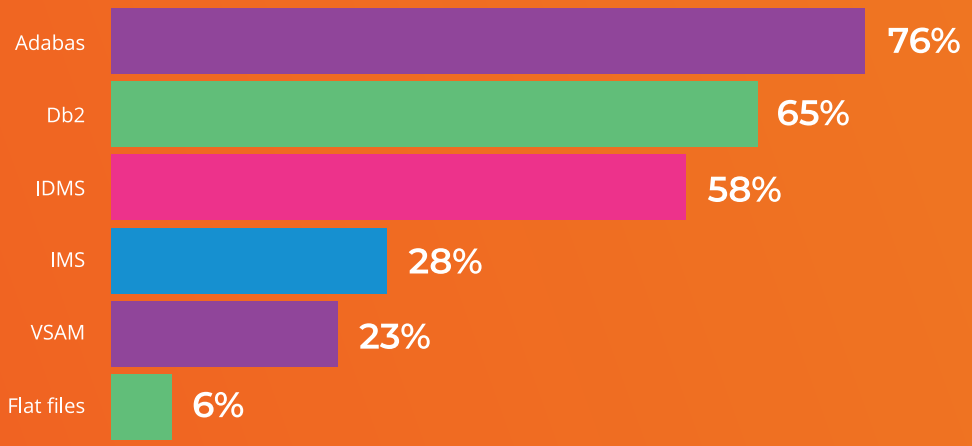
The COBOL programming language is more than 60 years' old and has declined in popularity partly because the talent pool has reached retirement age. Yet 75% of the enterprises we surveyed, say COBOL remains the most prominent (but not the only) language in their mainframe estate. Assembler – another aging language – follows close behind at 66%. Similarly, the majority of organizations use non-relational databases which date back as far as the 1970s, with 76% reporting that they rely on Adabas.

What are the most prominent languages in mainframe estates?



The IT skills gap

What data/database structures do mainframes use?



As developers with expertise in the most prominent legacy languages and databases retire, organizations risk experiencing huge disruptions to their operations. In most cases, new talent is not being trained to maintain and extend legacy systems, unless there is an existing mainframe environment that demands it. Most new companies are Cloud native, so there are very few instances of greenfield mainframe deployment in today's landscape. Thus, the skillsets that are in demand and emerging from colleges and universities are heavily focused on modern application development practices in Cloud environments.

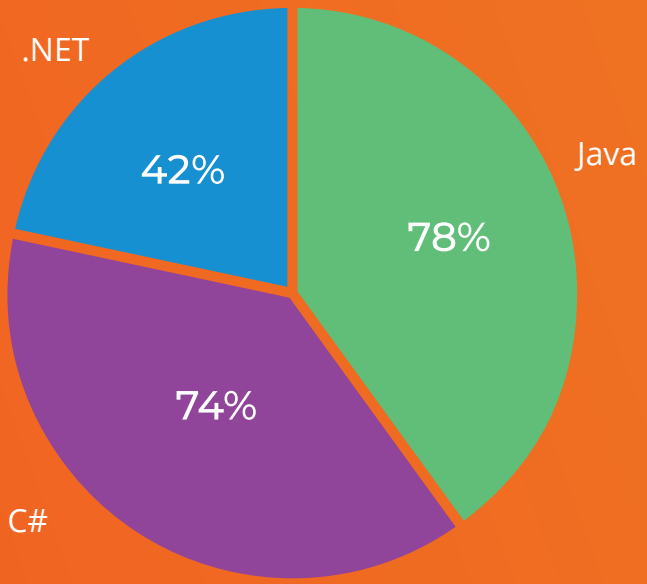
It's therefore no surprise that 89% of organizations are concerned about having access to the right IT talent to properly maintain and extend their legacy systems.

A number of issues have been highlighted as a result of the pandemic too. More than a third (36%) are concerned that people entering the workforce only have modern skills, while 33% are worried staff are retiring and taking their legacy skills with them (which increases to 40% for healthcare organizations). What's more, 29% say their staff don't want to learn legacy skills, while 28% fear they may lose talent to competitors using more modern technologies.

As the pace of digital transformation accelerates, there will be an ever-increasing demand for people who are skilled in modern application development – specifically Java, Python, C#, and Cloud-native deployment and orchestration tools such as Docker and Kubernetes. So, if organizations fail to modernize, they risk losing out on future talent. The good news is that 78% of organizations are already targeting – or planning to target – Java when modernizing their mainframe.

The IT skills gap

When considering mainframe modernization, what languages are most common targets?



When considering mainframe modernization, what databases are most common targets?

However, enterprises must not overcompensate on the skills imbalance by hyper-focusing on recruiting modern skills and disregarding the need for legacy talent. It's important they cross-train existing talent to improve their staff's ability to support both legacy and modern systems, particularly during and after major modernization initiatives.

The IT skills gap

A common strategy for closing the legacy skills gap is to take a refactoring approach to modernization which involves transforming legacy applications and databases into equivalent modern ecosystems using automated tooling. This enables companies to reap the rewards of legacy modernization with relatively tight timeframes, minimal costs and reduced risk by applying automation. This eliminates the need for code freezes and simplifies tasks such as universal adherence to standards and practices.

Nearly half of organizations say they prefer a refactoring approach (at 38%) – a solution which has increased in popularity over the last 12 months. More than a third (36%) say refactoring will help them reduce the legacy skills gap. This figure increases to 40% for US organizations alone who, as our research suggests, are more worried than their European counterparts about staff within their organization retiring and taking their skills with them.

Nearly half (46%) of organizations also say that refactoring would allow them to make use of the latest frameworks/architecture, which would support a move to any modern environment.

Conversely, organizations in the UK slightly favor rehosting over refactoring (47% vs 44%). In this approach, an enterprise's legacy estate is shifted into an emulation environment, where it can run on modern, distributed infrastructure in private data centers or the Cloud with minimal adaptation.

While rehosting allows a company to eliminate their expensive mainframe infrastructure and migrate to a Cloud environment quickly, retaining the same procedural code base doesn't address the diminishing developer talent pool issue or position an organization's ability to take advantage of powerful Cloud architectures and features such as microservices, on-demand elasticity, and horizontal scalability.

Sustainability and the Cloud

Sustainability is moving up the business agenda, with an ever-increasing demand for greener business initiatives from every corner of the globe. However, legacy systems are resource heavy. Mainframes are typically housed in dedicated, private data centers equipped with racks, lights, power, air conditioning, and more. These functions increase energy consumption and can therefore sabotage sustainability efforts. Data centers alone are projected to account for 3.2% of the world's greenhouse gas emissions by 2025.

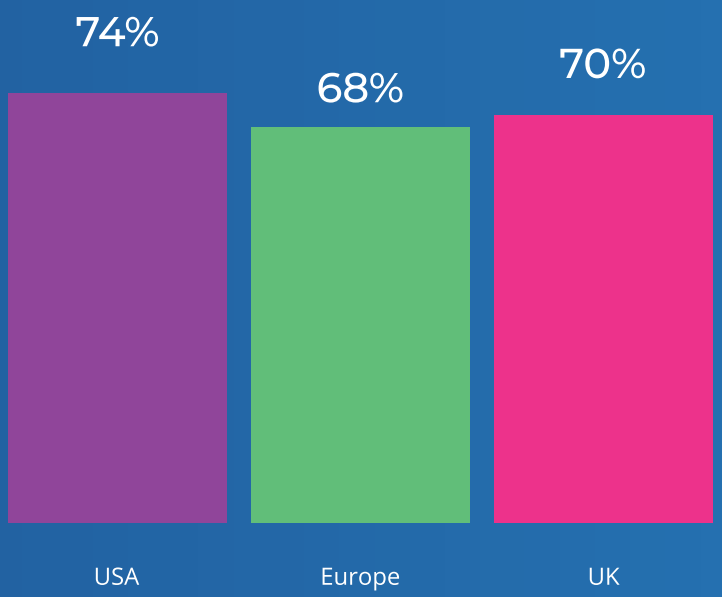
Cloud architectures, on the other hand, are more energy efficient due to multi-tenancy and, as a result, can house various workloads with only a fraction of the energy consumption of traditional infrastructure deployments. This allows enterprises to tap into available, shared resources of public Cloud environments to enhance their business capabilities, as well as reduce their use of natural resources.

It's encouraging to see that other organizations are following suit. In fact, our research reveals that moving to the Cloud is a key strategy for 83% of businesses – with a third feeling that the Cloud provides improved sustainability. More than half (52%) say they have active plans to move legacy applications to the Cloud within a year.

Ultimately, by modernizing the most urgent aspects of their legacy systems, companies will be able to significantly reduce their carbon footprint by minimizing the amount of power required to fuel these technologies. Most of our respondents agree, with 72% seeing their own modernization activity as a key part of improving their carbon footprint.

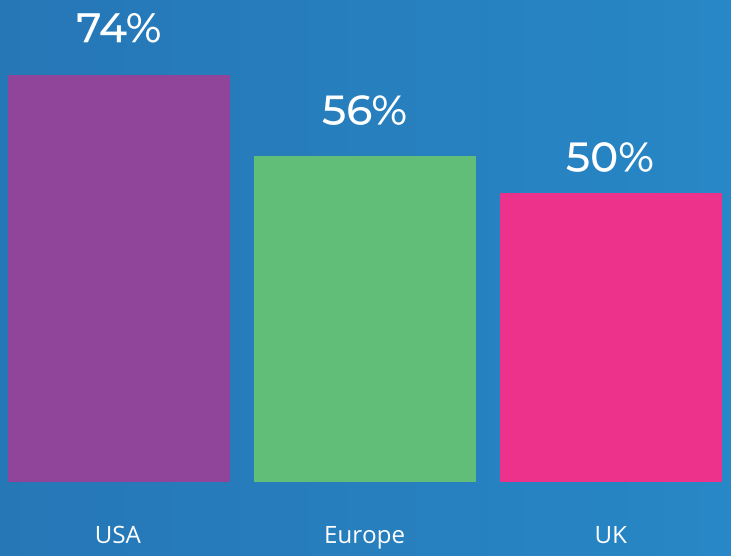
Sustainability and the Cloud

What percentage of respondents agreed that modernization activity is a key part of improving organizations' carbon footprint?



Going green has the added benefit of cost reduction too. Without reliance on mainframes, which charge their users by MIPS/MSUs, operational expenses fall drastically. Nearly two-thirds (62%) agree the Cloud is cheaper to operate than mainframes. This increases to 70% for organizations in the US who, as our research has previously shown, are also the biggest spenders on mainframes.

What percentage of respondents agree that the Cloud is cheaper to operate than mainframes?



Sustainability and the Cloud

Our research indicates that 52% of respondents continue to pay unnecessary amounts for their mainframes and supporting infrastructure. Over sixty percent (62%) say they could save up to a third of their IT expenditure if they modernized just one legacy system.

While the math is complex, applications in Cloud environments tend to consume just 8-12% of a mainframe's annual per MIPS expense for a comparable workload.

To put it another way, organizations could save an average of US$28 million if they modernized the most urgent aspect of their legacy systems. Of the vertical markets, financial services is poised for the biggest potential savings at US$40 million – while large enterprises with annual revenues of more than US$10 billion could save up to a massive US$44 million.

Ultimately, while modernization projects require deep domain expertise, cross-functional commitment, and careful implementation, the cost savings and risk reduction of extricating an organization from aging legacy systems with a shrinking talent pool of support is significant. Engaging a modernization partner with a proven track record will ensure modernization projects are a success.

“The COVID pandemic, growing focus on sustainability, supply-chain disruptions, and other cries challenge us all to adapt, evolve, and step up the pace of innovation. Modernization of legacy workloads is key to realizing success in these endeavors.”

- Paul R. Ikin, Global Lead – Mainframe Modernization Partners, Google Cloud

About Advanced

Advanced is a leading international provider of application modernization services, with unique expertise in the legacy modernization market.

With more than 500 modernization projects completed worldwide, and 2.5 billion lines of code processed through our solutions, we have been driving IT efficiency, agility, and competitive advantage for customers through core application and database transformations for over 35 years.

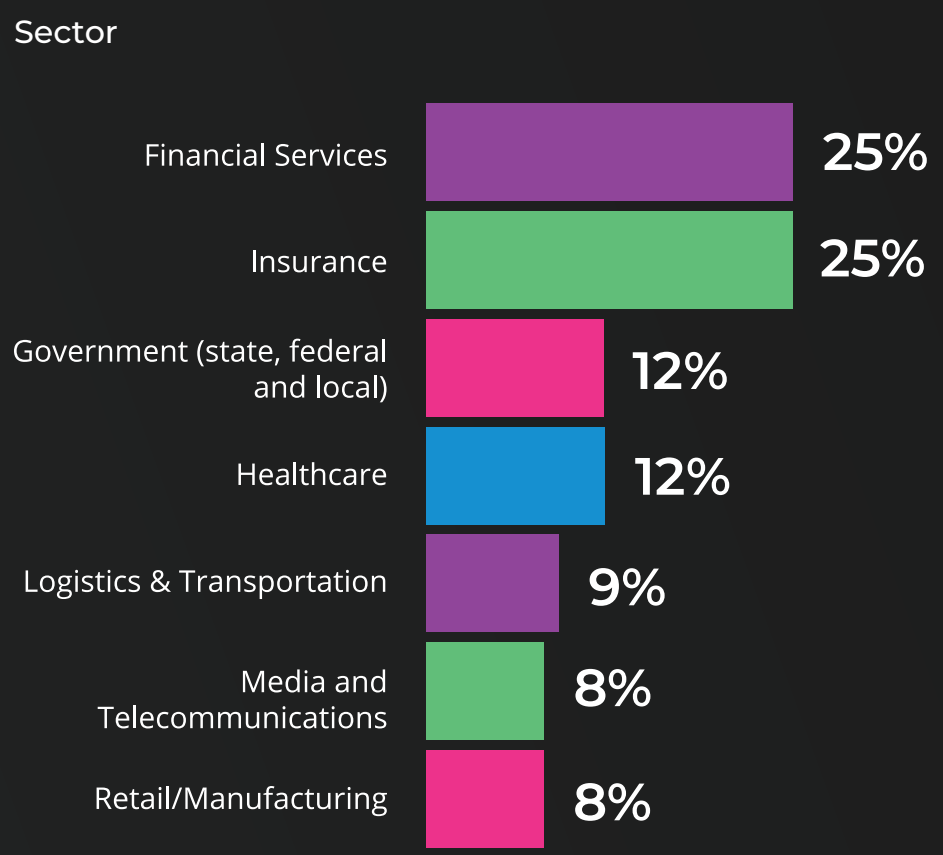
Over that time, we have helped organizations across all sectors including the UK's Department for Work and Pensions, FedEx and The New York Times.

For more information, visit:
modernsystems.oneadvanced.com

Methodology

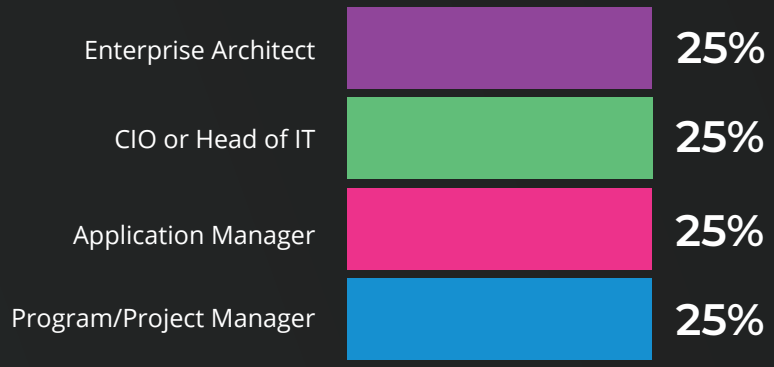
The 2021 Mainframe Modernization Business Barometer Report was carried out online by Coleman Parks throughout April and May 2021. The sample comprised 400 people working for large enterprises in Europe and the US with a minimum annual turnover of US$1 billion. The respondents included enterprise architects, CIOs, heads of IT, application managers and program/project managers in a range of industries.

Please note:
Some figures may not add up to 100% due to rounding.

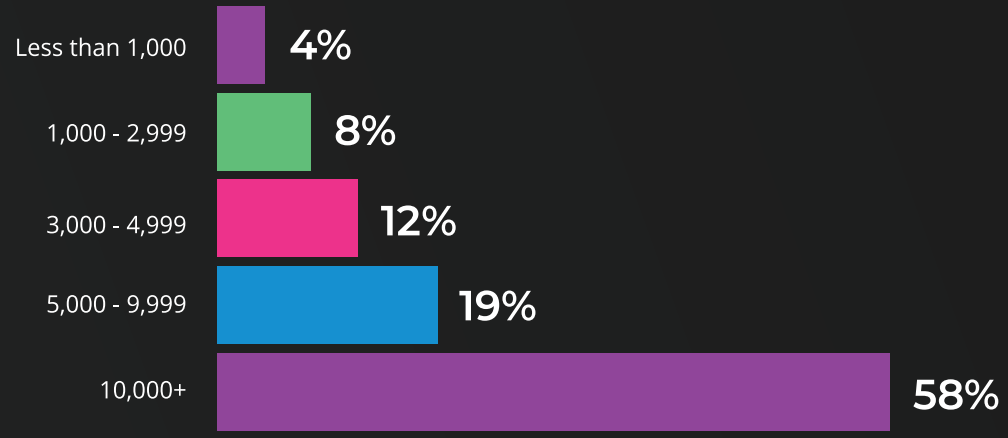


Methodology

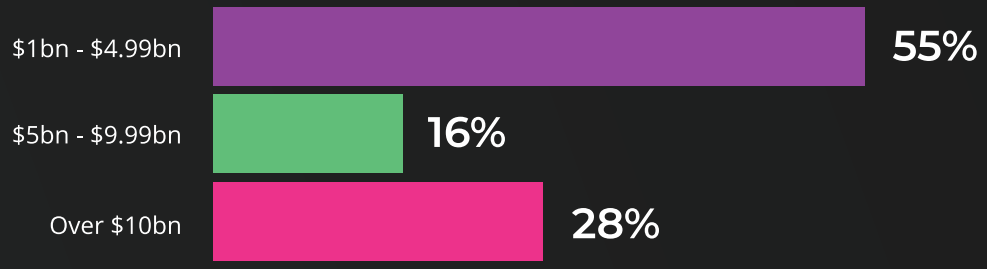
Job Title



Number of Employees



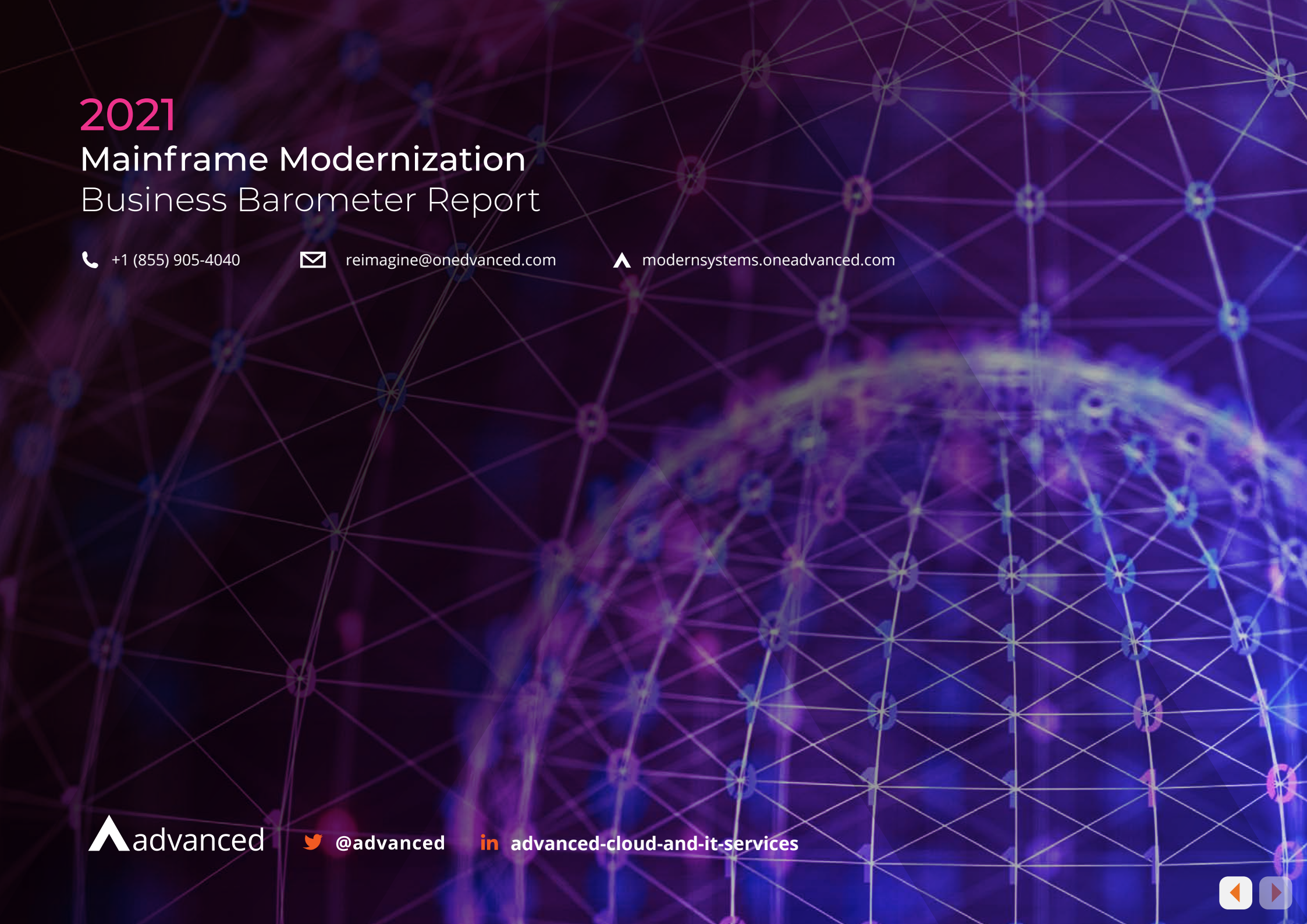
Revenue (US$)



Methodology

A breakdown of cost savings by sector and revenue.

2021	$USD million			
SECTOR	Average	$1bn - $4.99bn	$5bn - $9.99bn	Over $10bn
Financial Services	39.6	19.8	44.8	67.7
Media and Telecommunications	20.4	10.7	21.1	53.4
Healthcare	14.3	8.7	26.1	27.9
Logistics & Transportation	18.3	14.8	24.4	25.1
Government (state, federal and local)	22.4	12.8	16.0	64.0
Retail / Manufacturing)	7.4	4.7	9.3	16.1
Insurance	21.6	9.3	21.1	31.2
Average	**23.8**	**12.4**	**26.3**	**44.4**



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