MARKET PERSPECTIVE

The Future of Latin America Drives Legacy Application Modernization

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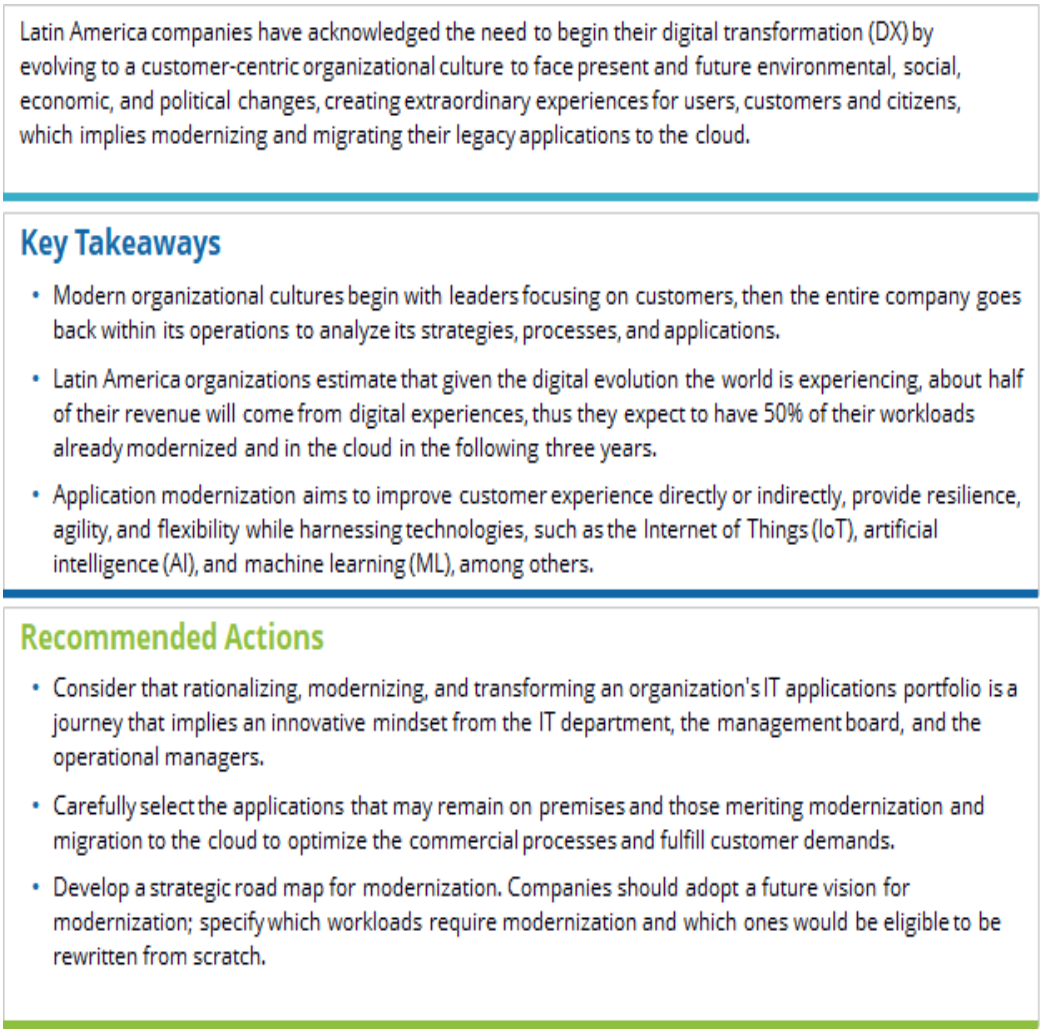
EXECUTIVE SNAPSHOT

FIGURE 1

Executive Snapshot: The Future of Latin America Drives Legacy Application Modernization



Source: IDC, 2021

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NEW MARKET DEVELOPMENTS AND DYNAMICS

Over the past five years, Latin America organizations have been rethinking and streamlining their business applications portfolio to create a modernization plan that helps them digitally transform their businesses. Market changes have forced companies to accelerate these processes and prioritize their systems modernization in light of new needs and use cases. Additionally, they understood that these activities to rationalize, modernize, and transform their IT portfolio would continue indefinitely.

All these disruptions have triggered a culture of innovation that transforms IT and impacts companies' mindset and ways of doing business. Digitally transformed organizations understand that rationalizing, modernizing, and transforming their IT portfolio and operations is a continuous process in a world where technology is becoming cheaper and easier to use.

Modern Business and CIO Priorities

The latest crises and new organizational behavioral patterns obliged a sudden shift to remote work and exposed on-premises software shortcomings. CEOs and CIOs quickly changed their priorities in the face of economic crises and market disruptions; employees that would have to work from home frequently did not have the appropriate equipment, neither could access the systems to perform remotely, as expected.

Digital transformation (DX) has brought the need to bring rigid and complex legacy applications to cloud systems to, from this point, evolve toward more intuitive and intelligent user interfaces. Some CIOs may consider software as a service (SaaS) a good option to modernize applications; nevertheless, it is not the only one since it does not necessarily cover all the companies' needs. Furthermore, there is no standard to follow; it depends on each organization's needs and strategy. As a matter of fact, there are numerous very competitive cloud-based options, such as lift-and-shift, which is an option modernized in terms of operation, security, and resilience. Given the variety of options available, most companies in Latin America should decide their best modernization option; having an expert partner may be of great help at this point.

Suddenly, Latin America companies, such as Oncoclínicas and Banco de Bogota, among many others, have found themselves forced to reallocate budgets to fulfill needs, such as home-office. This new use case fueled the purchase of hundreds of laptops, drove VPN access for remote workers, migrated their systems to SaaS, and enabled cloud applications to continue operating. It was only the beginning of technological anxiety due to an accelerated DX because many other activities needed digitization at once, such as some manufacturing robotized processes, online sales and deliveries, and intelligent customer care, among many others.

Hereafter, companies have been moving their old legacy business applications away from the old monolithic structures from the last 25 years to drive their businesses toward digital environments with a greater pace of innovation. Cloud services open an opportunity to have various benefits and even innovation within the modernization process.

IDC expects this trend to continue, as evidenced by the global functional and line-of-business (LOB) market for enterprise applications forecasts. Factually, the cloud provides the ability to have more standardized operational processes and information in real time; it has also proven to be scalable and accessible any time from any place.

Understand Customer Needs and Move Backward

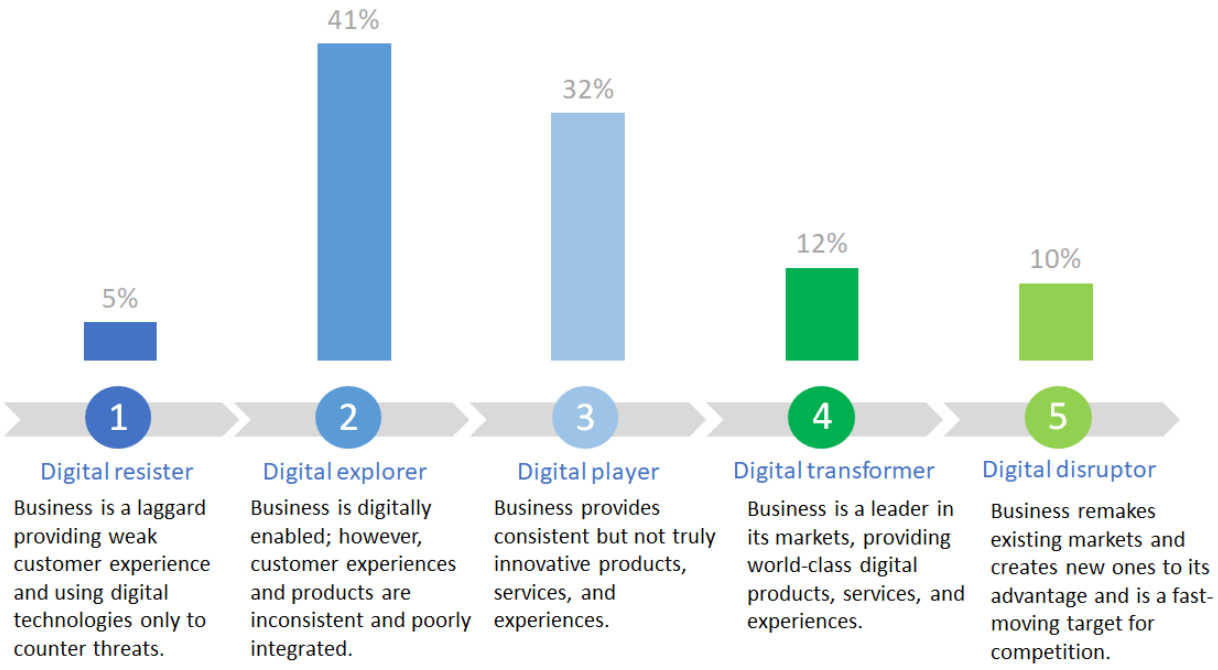
The latest environmental, social, economic, and political events — some of them significantly impacting and unfortunate — have driven new organizational cultures. Additionally, these challenges have exposed that many Latin America organizations are not yet digitally enabled enough and need to accelerate DX.

Several other companies in the region have already decided to adopt a customer-centric culture driving an accelerated digitization and innovation journey; these organizations are thinking about the buyer needs first to then go backward toward their processes and create not only good but extraordinary experiences, seed trust, and build a sense of community.

According to IDC's Maturity Digital Transformation Model, companies' digital maturity may be measured in five levels. As per this report's latest 2021 version (published in January 2021), 41% of Latin America enterprises were on level 3, called "Digital Explorer" while only 10% were in the highest level called "Digital Disruptor," as seen in Figure 2.

FIGURE 2

IDC MaturityScape Benchmark: Digital Transformation in Latin America



Source: IDC, 2021

IDC sees application modernization has become a higher priority, enabling organizations to emerge and withstand market ups and downs to better connect and engage with customers, providers, and users in a world of digital experiences. Additionally, this is an essential agent in becoming resilient in facing other future crises.

The term "application modernization" has evolved and gained a broad set of meanings, from creating a new organizational culture to updating their application infrastructure and migrating on-premises applications to cloud platforms.

IDC defines application modernization modalities and procedures as follows:

- **Applications rehosting.** Applications "lift and shift" from one platform to the cloud with minimal to zero changes
- **Applications replatforming.** Applications migration from on-premises to cloud environment with minor changes leveraging some of the cloud platform's functionalities, such as autoscaling and high availability
- **Application refactoring.** Re-architecting applications to optimize their functionality for the cloud, such as transforming monolithic applications into microservices architectures using containers
- **Integration with modern development tools, such as IDEs, DevOps toolchains, and others.** Modern development tools, such as cloud-based integrated development environments (IDEs), development and IT operations (DevOps) toolchains, application performance indicators (APIs), microservices, and containers, used to extend legacy applications functionality
- **Application rewriting.** Rewriting and coding legacy applications from scratch

The need for faster business operations and greater flexibility to respond to customer and user needs with better digital experiences have accelerated priorities related to application modernization.

According to the results from *IDC's Application Services Survey*, conducted in 2020, application modernization priority has increased with 71% of organizations rating it as a high or top priority and 84% expecting it to continue as a priority in the following two or three years. IDC advises CIOs to consider the following steps when creating their application modernization strategies:

- **Review your organization's long-term application strategy.** Organizations should carefully measure the application modernization influence across their portfolio by assessing their workloads' use versus generating business value with customer-centric use cases.
- **Build a holistic modernization strategy to address a variety of challenges.** Companies face a variety of challenges in achieving their modernization goals and developing aligned IT and business strategies. Thus, before modernizing applications, organizations must develop metrics attuned to corporate and IT objectives to establish an effective road map for their specific needs.
- **Be ready to use more than one application modernization tactic across the portfolio.** Organizations show various sets of preferences for modernizing their existing applications. Given that their portfolios are diverse, they must analyze the tactics that may impact other applications and downstream workflows. Companies can benefit from flexibility when choosing the optimal architecture for specific workloads, which becomes critical to help them take advantage of various modernization methods to overcome challenges and achieve their business goals.

Make sure you choose a cloud service provider that can offer multiple paths toward modernization. Choose a provider with recognized cutting-edge technology locally, regionally, and globally that helps improve productivity and meet IT and business goals:

- Helps reduce IT infrastructure costs
- Guarantees operational resilience and helps to achieve agility objectives
- Gives certainty for businesses' cloud strategic plans and a road map with clear and timely deliverables
- Has world-class proven methodologies for accelerated migration to the cloud and services
- Invests in qualified human resources and global and regional support with a robust business ecosystem and infrastructure available in Latin America
- Manages in-depth knowledge of every client industry and the most relevant use cases in business operations
- Has the technical, human, and financial capacity to support the growth of cloud service users

Application Workloads Requiring Modernization, Such as Production, ECM, SCM, ERM, Collaboration, Industry Applications, and In-House Development

Application portfolios are expanding to support more LOBs and highly integrated processes. Higher levels of standardization and automation are the focal points for organizations to maximize their digitization outcomes.

From an application development perspective, IDC sees DX as:

- **The development of new applications.** These strategies focus on solving business priorities in a digital environment.
- **Modernization of legacy applications.** These initiatives intend to quickly adapt business' old workloads and processes to new markets and customer needs.

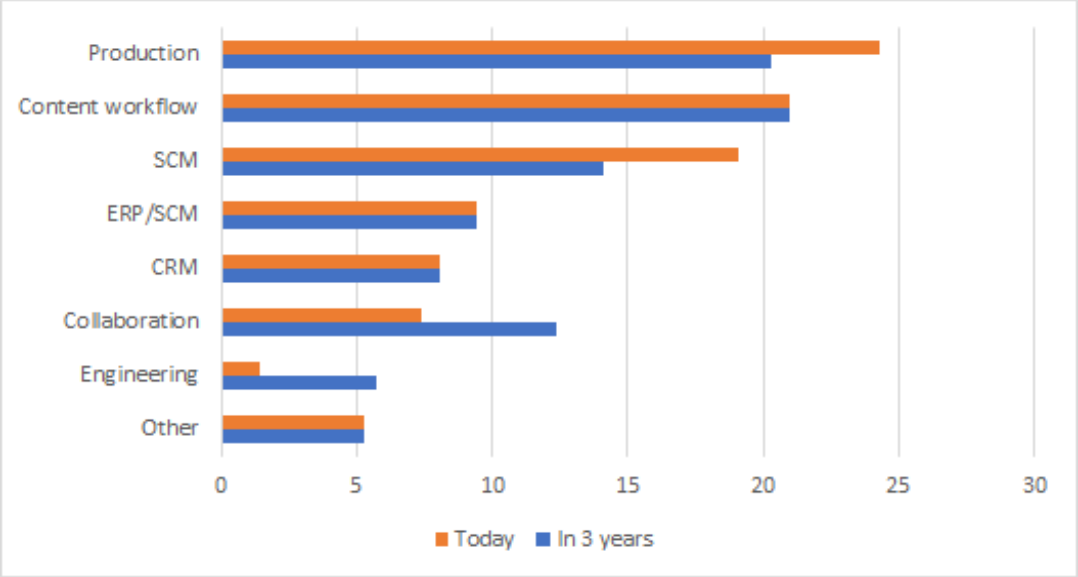
However, on-premises workloads updates must adapt to specific budgets to ensure their digitization profitability.

Currently, companies are expanding their application portfolios to support more business lines and highly integrated processes. Markets are experiencing higher levels of standardization and automation for various application delivery elements that will continue to be focal points for organizations to maximize application modernization outcomes.

Today's modernization priorities are production and operations workloads that optimize processes related to the planning and execution of manufacturing, production, services, public sector operations, and other commercial activities. Contrastingly, content workflows are the ones to modernize in the future. Figure 3 shows the workloads modernization priorities in the following three years.

FIGURE 3

Application Workloads Requiring Modernization



Note: SCM, ERP, and CRM stand for supply chain management, enterprise resource planning, and customer relationship management, respectively.

Source: IDC, 2021

Legacy Application Modernization

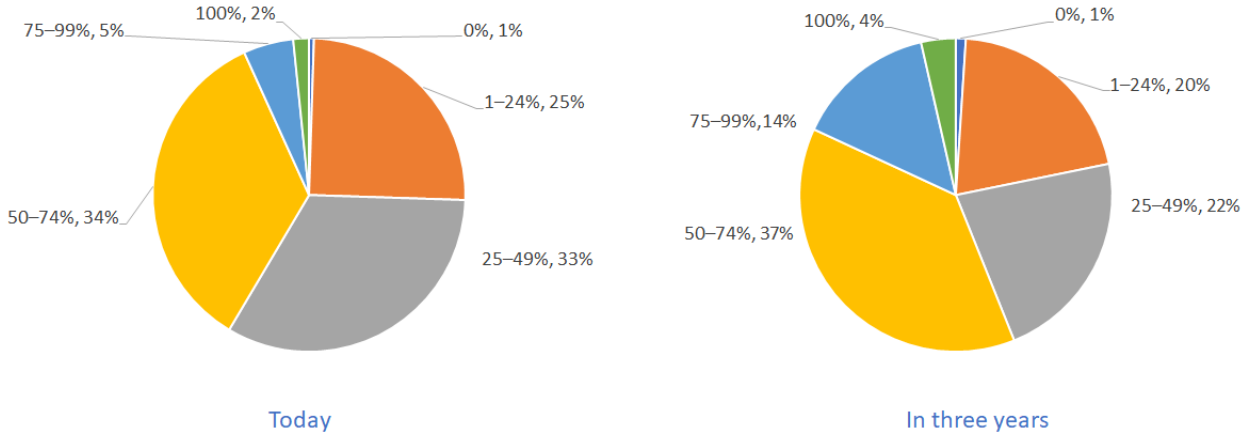
According to *IDC's PaaSView and the Developer 2020: Key Worldwide Trends in Contemporary Application Development* (IDC #US46651020, July 2020), a recent worldwide survey with 2,500 developers performed in July 2020, more than half of workloads in enterprises are legacy applications, which IDC defines as critical for the business' operation despite being outdated or obsolete.

IDC estimates that the top 4,000 companies in Latin America operate with 50% of their workloads still legacy, which indicates many applications are yet to modernize.

Figure 4 shows the percentage of the overall workload portfolios that will need modernization in organizations in three years.

FIGURE 4

Percent of Application Portfolio Requiring Modernization (0 to 100% Scale)



Source: IDC, 2021

Organizations estimate that 40% of their application portfolios have been already migrated to a cloud environment, and in three years, they will have 50% of their workload portfolios digitized in the cloud.

Regionally, *IDC Latin America's Investment Trends Study 2020*, a survey carried out among companies with more than 500 employees, showed that 69% of them would pay to modernize and migrate their workloads after conducting an evaluation considering the priority, technical, business, functional, and economic implications of modernizing and migrating them to the cloud. Thus, Latin America companies intend to assess their most relevant workloads case-by-case before embarking on any modernization process.

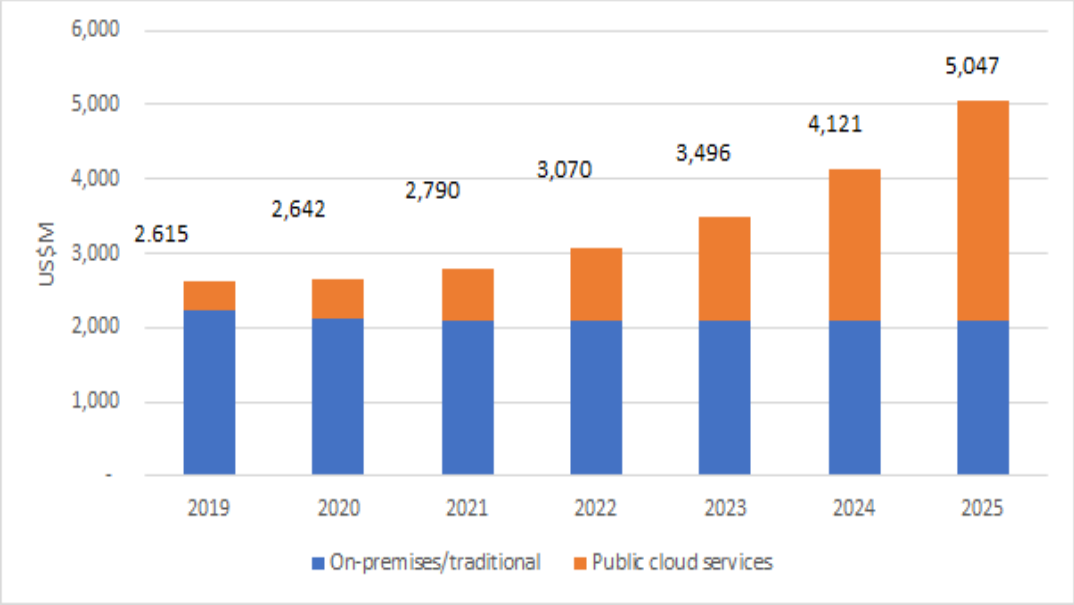
Organizations must keep in mind that data-platform modernization is essential to digitize use cases, monetize information, and create digital experiences, regardless of the industry.

Successful modernization strategies should pay special attention to workloads oriented to large repositories or data warehouses; they should modernize the data warehouse infrastructure to resize it depending on the current and future needs or build data lakes to manage structured or unstructured data to create advanced analytical models.

IDC believes there is a great space to modernize the data management platform; companies spend US$2.0 billion annually on on-premises solutions to maintain the data management platform, thus migration to the cloud is a great opportunity to modernize it and align with new digital services the market demands. As seen in Figure 5, the expected spending on cloud services to modernize data management platforms will be US$698 million in 2021 but will have reached US$2,955 million by 2025, representing a compound annual growth rate (CAGR) of 37% from 2020 to 2025.

FIGURE 5

Latin America Spending in Cloud Services Related to the Data Management Platform Modernization, 2019—2025



Source: IDC Semiannual Public Cloud Services Tracker, 2021

Much of the application modernization impact relates to automating use cases, particularly those that incorporate new technologies directly related to customer service and its variants, such as citizen and account holder services, among others.

Ultimately, organizations' decisions may vary across:

- **Application portfolio management.** Portfolios may be diverse and force organizations to be selective about the applications and workloads they choose to manage in-house versus those they send to third-party service providers.
- **Application modernization and migration.** Modernization tactics are as diverse as application portfolios themselves; thereby, organizations need to lean upon a combination of modernization tactics to maximize the value of their business objectives.
- **DevOps.** Part of modernizing applications involves adjusting talent, processes, organizational alignment, and application delivery methodologies to bridge the gaps between technology and personnel, together with the management and the company's cultural transformation.

IDC recommends companies initiate an analysis leading to a functional assessment of each workload, their dependency on the business operation, and opportunities to modernize their on-premises environments or replace them.

Primary Goals with Application Modernization (Flexibility, Agility, Cost, Integration)

Most application modernization investments in Latin America are currently associated with projects addressing transactional workloads. They aim to improve customer experience directly or indirectly and provide further agility and flexibility to the companies' processes using a significant amount of innovation while taking advantage of technologies, such as the Internet of Things (IoT), artificial intelligence (AI), and machine learning (ML), among other new technologies.

Apart from assessing their most relevant applications, companies realize that the implications of modernizing their workloads may take their financial model from capex to opex and facilitate the creation of services and customer experiences based on business strategy. IDC estimates that companies will spend up to 33% with application modernization and migration to the cloud, increasing 19% of the average annual IT budget.

In brief, market trends point to the digitization and more reliable customer experiences as permanent organizational culture. Thus, organizations seek to focus on application modernization projects that support their IT strategies and business economic recovery goals.

Additionally, thinking of the medium and long term, companies are centering on four priority objectives:

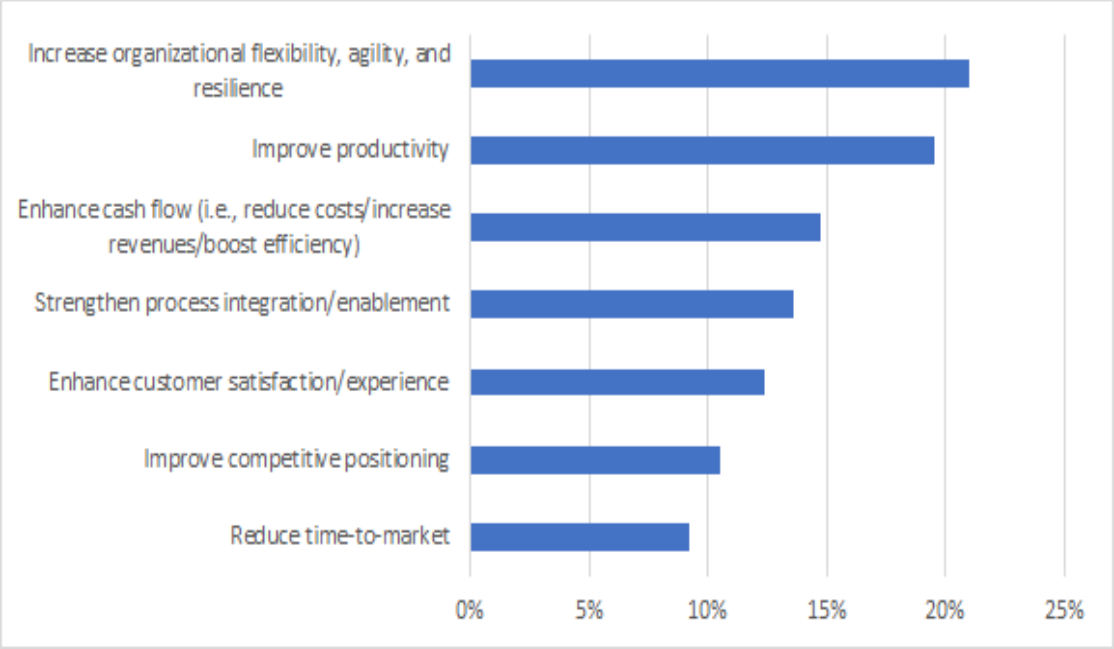
- **Modernize.** Keep the business running efficiently at a much lower cost than in the past.
- **Reinvent.** Ensure business continuity anticipating new market requirements to achieve sustained growth.
- **Transform.** Create business agility systematically and strategically to create new growth opportunities or sources of income.
- **Development speed.** Move fast when modernizing applications. Developers must accelerate the pace of innovation. There is a wide range of tools and ways that AI/ML can help improve the speed and efficiency of development, for example, finding expensive lines of code, preventing errors, or suggesting code, thus making them essential elements that will quickly bring much evolution.

Given these factors, IDC predicts that DX will continue to accelerate and be an essential element of Latin America companies' strategic agenda. The consensus shows that this trend directly modernizes workloads and transform their current consumer services to create new experiences, such as new platforms for assets management and paying capabilities for bank account holders.

Goals around modernization primarily revolve around enhancing business agility and resource productivity. As said before, organizations will invest as far as they see success and a return on their investments and a gateway to their financial recovery and resilience, as seen in Figure 6.

FIGURE 6

Primary Goal with Application Modernization



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Source: *IDC's Q4 2020 Application Services Survey, 2021*

Organizational Structure

For several years, Latin America companies have been trying to go from traditional slow hierarchies to flexible and fast decision-making models to achieve agile transformations. The pandemic brought a sense of urgency to these efforts, creating immediate needs for adaptability, speed, and efficiency. Learning and decision making changed and had to be done in real time.

As companies adapt to the new normal, many seek to continue an agile transformation; in any case, adopting agile organizational cultures can improve their success chances.

A factor leading a company to be highly successful and resilient is its ability to adapt. As they understand the core of DX, organizations strive to understand current and prospective customers; they seek to evolve rapidly. Transformed companies focus on customers and employees first as the cornerstones to opening new markets and competing to win; DX has people at the core of the operations and technology at their service.

Technology continues to evolve and contribute to meeting customer, user, and citizen needs. It is the people who have to create the strategies that lead to modern corporate governance and operation. A company can only function sustainably when swiftly adapting to change.

IDC suggests organizations create DX boards to guide teams to embrace the cultural and mindset transformation with agile strategies.

Becoming an agile organization is a long-term proposition that takes place in phases. This journey will not only spur transformation but will also help eliminate rigidity in the organization. It will help identify and solve challenges toward transformation and a focus on people and value.

A people- and customer-centric approach also ensures less infighting and more attention paid to providing better customer and employee experiences. These cultural changes outcomes are greater speed, resilience, and adaptability to stay one step ahead of the competition.

Latin America companies tend to be conservative and not especially adaptable; for example, some still believe in strategies focused on cost reduction. Organizations must perform a profound change by adopting greater agility and adaptability as they consider modernization investments prioritizing people and creating new business models. Companies need to be empowered to make decisions as owners of their work. Communication is not enough; leaders need to instill mechanisms into the organizational culture with acts that reinforce behaviors rather than rely on intentions.

IDC recommends that Latin America companies do a deep analysis to create the appropriate mechanisms to modernize their culture:

- Communicate the urgency of change, inspire employees toward innovation and evolution, and help them understand why an agile mindset is the best.
- Understand uncertainty and ambiguity as opportunities.
- Allow and celebrate the culture of error. Making mistakes is part of the development itself; new ways of thinking and new approaches will work better, and the DX will be faster by keeping this in mind.
- Incorporate new viewpoints, which may come from the least expected people or situations. It is always positive to listen to new ideas even if they do not come from experts.
- Listening to customers helps understand their needs better; besides, when customers feel their opinions are taken seriously, trust builds, leading to commercial success.
- Establish strong partnerships; it is advisable to seek innovative business partners to learn from as well as their corporate culture.
- Application modernization requires deep business process analysis that may need organizational changes; thus, it is important to consider an effective change strategy.

Top Challenges of Application Modernization

Application modernization initiatives may become quite challenging, especially because leaders must realize that these actions run across the whole organization. They center on business and IT strategies, as well as on the existing organizational culture. Challenges begin with the leadership and spread across processes, funds, technology tools, and employee skills.

So far, DX has had a profound impact on Latin America companies and their underlying processes. Nevertheless, application modernization initiatives are quickly becoming critical elements to unlock the digital business value, and, as a result, the strategic importance of these initiatives is rising. Let us look at the most relevant challenges companies are facing to modernize their applications.

Lack of Leadership and Management Support

- Company leaders should always participate closely in application modernization strategies. However, they may be resistant to be part of technology projects.
- Latin America C-level executives, business leaders, and stakeholders need to see IT and technological modernization as new revenue sources instead of expenses, but also to increase productivity while minimizing cybersecurity risks and ensuring compliance.
- Lack of interest and accountability stirs risks and deficiencies when strategizing new business models and their stages.
- Companies' leaders still lack new governance models to control cloud resources, modernization, and migration processes. Getting this right is key to becoming truly digitally transformed.
- Often organizations are yet to adopt a new digital and customer-centric culture and spread it across the company.

Deficient Business Strategy

- All mission-critical workloads need to be thoroughly evaluated. Leaders need to actively participate in this process and ensure the selected workloads align with the desired business outcome and financial goals.
- Assessing, classifying, and matching the right workload with the proper infrastructure and modernization approach is a key challenge for companies to modernize their applications.
- Modernized applications must provide resilience and flexibility and generate satisfactory experiences for internal users and customers.
- Ripping and replacing applications is costly; some critical legacy applications might not be eligible to migrate to the cloud.
- When developing a DX platform strategy, companies need the elements to decide about the organization's culture, technologies, and partnerships to help scale the modernization initiatives quickly and cost-efficiently; if not, challenges escalate.

In brief, businesses are finding it challenging to align their IT and platform investments with business objectives in a holistic and customer-centric modernization strategy.

Weak IT Strategy

- When some organizations decide to transform digitally, they do not want to abandon all their existing software built and deployed on premises; therefore, coexistence between legacy and cloud environments might become challenging.
- Develop the proper migration strategy and technologies that are crucial to scaling modernization across the enterprise.
- The cloud platform becomes the new battleground for innovation because it represents a paradigm shift in developing and deploying applications.
- Mission-critical applications must prove their resilience by showing the same or better performance and availability after modernizing and migrating. Thus, they need to be tested and retested to ensure they meet the availability and performance targets.
- The inability to leverage continuous integration/continuous delivery (CI/CD) methodologies, application catalogs, and cloud-native services to enrich enterprise applications due quickly and seamlessly to fragmented technology ecosystems can be another obstacle.

- The failure to extract the maximum use of existing IT investments while modernizing applications may cause wasted resources; for example, perhaps the entire application does not need to be rewritten or refactored.
- When assessing modern IT options available, delays in considering new technologies and best practices, such as DevOps, Kubernetes, serverless models, or AI, may bring challenges and economic losses.

Business and IT Resistant Culture

- Adapting people and processes may require new skill sets and disrupt the current operations; lack of effectiveness due to employees' resistance to change, fear of losing their jobs, and the stress of hiring, training, and retaining only the right talent becomes challenging.
- Legacy users and IT professionals are likely to set alternate manual processes and shortcuts to achieve their goals with costly security and operative risks.
- Companies are resistant to set training budgets; they usually question employee loyalty and willingness to make an effort to update and adopt new skills. This fact affects their maturity level by slowing down the adoption of hard and soft skills with proper training and certification. C-level and the management need to leverage training and certifications budgets to minimize skills gaps.
- One of the most significant challenges companies face is transforming the organizational mindset and competencies to be ready for reinvention and innovation; oftentimes, developing cooperation and commitment from outdated staff to update and fulfill training courses and certifications becomes a modernization challenge to companies.
- Some companies do not mind leveraging the cloud providers' training and certification courses grouped by role, solutions area, or other specific needs within organizations.

Find and Retain Talent to Modernize and Migrate Legacy Applications

- Companies struggle to find and retain experienced and skilled professionals in outdated applications as well as in the new technologies. Outdated systems leave managers lacking information and a skillful team to migrate the data in a modernization process. Migrating legacy systems is complex, and companies risk losing crucial data if modernization does not perform efficiently.
- Find updated skilled professionals; since new technologies have many components, understanding all of them is complex, yet comprehending the interdependencies between them is even more complicated.
- Retaining skilled application development talents is challenging; additionally, some soft skills are difficult to adopt.

Legacy Application Modernization Budget Overrun

- Exceeding budget and time goals is a technology project nightmare that slows down modernization.
- Often, major challenges come from unknown dependencies due to complex application architecture.
- Lack of planning
- Execution flaws

If not planned and executed carefully, legacy applications digitization and migration projects may drain resources and budgets from other critical IT activities, increasing the risk to mislead business objectives.

Finding the Appropriate Business Partner Is Challenging

- Evaluating and selecting adequate advisory and consulting firms, whether systems integrators, digital marketing agencies, and other specialized providers, becomes challenging without the appropriate professionals.
- Integrating skills from both internal and external teams without similar skills levels is difficult.

The transformational journey that enterprises are embarking upon and their appetite to modernize their applications have brought significant business opportunities for several service providers. However, while the frenzy of enterprise demands has created a robust market for application modernization services, the abundance of provider choices has forced buyers to wrestle with complex decisions as they consider various strategic alternatives.

Perceived Lack of Security and Governance in Latin America

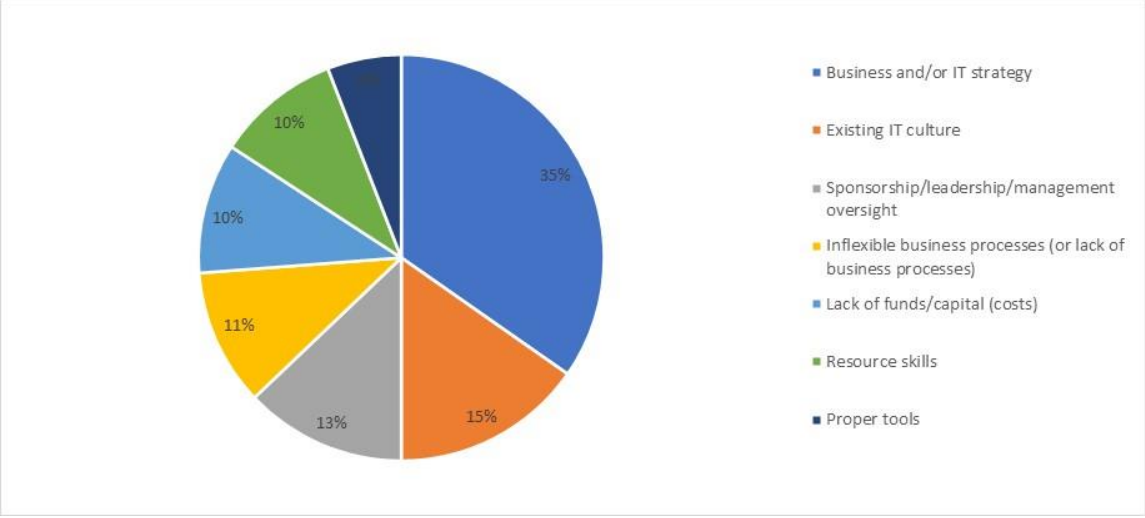
- Give up a certain degree of control over their infrastructure when in the public cloud.
- Adopt new security policies that application modernization and migration imply.
- Update old practices and define new ones to conform to an entirely new model.

Regularly, the differences between on-premises and public cloud infrastructure limit the reuse of old established security and governance procedures and tools. IDC suggests Latin America organizations work with a technology cloud partner using facts and data so that companies can move forward based on thorough analysis instead of perceptions.

Before deciding to opt for anything new, it is vital to evaluate the associated risks and challenges. Organizations can modernize their legacy apps in many ways but addressing these by preparing an appropriate modernization strategy can reduce the app modernization challenges.

FIGURE 7

Top Challenges of Application Modernization



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Source: *IDC's Q4 2020 Application Services Survey, 2021*

Modernization Modalities

IDC defines a modern application platform (MAP) as a collection of services accelerating applications development and deployment based on an open container infrastructure. Such offerings are typically delivered through platform as a service (PaaS) and should include observability, governability, and risk reduction capabilities, together with support for containers, container orchestration, and serverless offerings, plus the ability to host end-to-end CI/CD toolchains.

As new applications are developed and existing ones are modified to take advantage of emerging cloud technologies, vendors deliver services to help enterprises successfully embark on the cloud-native journey more quickly. Containers are ideal for packing workloads into a more portable and deployable format into modern infrastructure at a higher density and fully leveraging multicloud options. These cloud environments typically offer a collection of cloud services that are consumable by these containerized applications, providing data services, AI and ML services, IoT services, and more.

Breaking applications into microservices help enterprises transition to an architecture that allows them to quickly react to customer and end-user demands, size the specific components appropriately, reduce reaction times, and remove the need to scale complete virtual machines (VMs) in response to events. Additionally, serverless technologies help customers focus on application code, leaving all other aspects of infrastructure management to the cloud provider while accelerating the application development even further.

These attributes of a modern application platform collectively represent an attractive journey for existing organizations or a must-use environment for new players.

IDC concludes that given the amount of DX in Latin America, companies' urgency to embrace a modern application platform is enormous and continues to become more critical each year.

The Modern Application Platform, a Developer's Choice

Historically, developers have relied on various vendors, developing communities, and even proprietary tools to build, integrate, and maintain applications. These tools were typically software installed on developers' workstations and likely ran on Windows, Unix, or Linux operating systems. They needed to learn to solve many of the challenges encountered when working in these localized development environments, such as:

- Having the appropriate tools updated and interfaces on developer workstations can take weeks.
- Develop, integrate, or maintain applications running on computers with different operating systems than the development platforms or databases.
- Control versions between internal and external development teams.
- Manage applications written in various programming languages.
- Logging in updated apps is challenging when access data is siloed.
- Create applications only compatible with the infrastructure, and back-end servers create limitations.
- Complying with regulations becomes challenging.
- Working with applications in legacy codes creates access and security limitations.

Those solutions are unsuitable for today's digital businesses that rely heavily on technology and data to drive decision making and customer engagement. Today's developers choose to create and

maintain automated applications in the cloud that are easy to access and manage. Having documented methodologies and delivery models, such as microservices, containers, and DevOps, guarantees the workloads' functionality regardless of the organization's changes or whether the team of developers is internal or external.

Recently, companies are making substantial efforts to mitigate these challenges that hold back developer productivity. Disruptions have pushed actions to accelerate their ability to deliver quality apps and updates quickly.

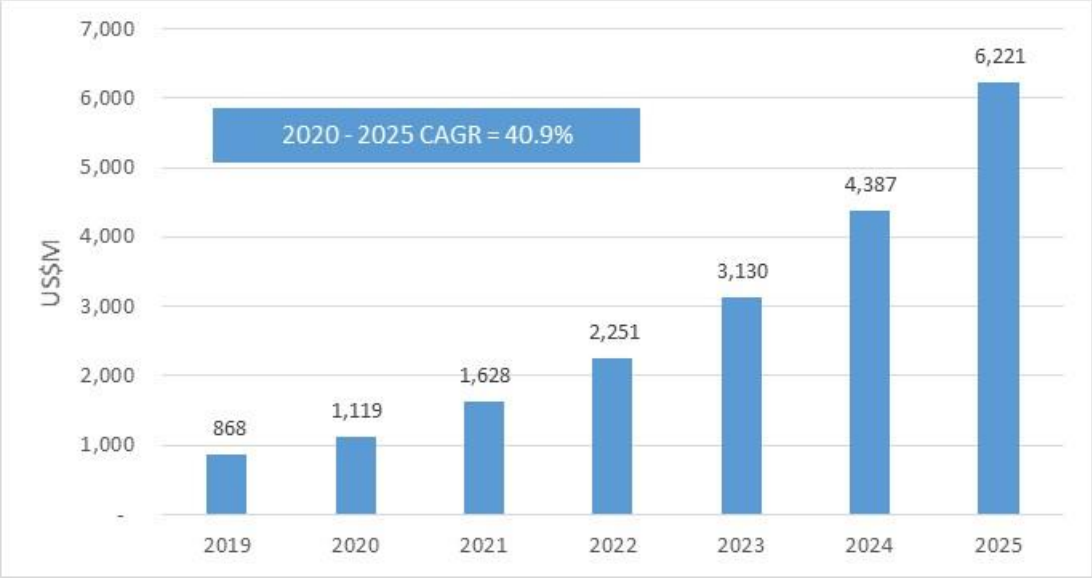
Methodologies, such as object-oriented programming, optimize and share code bases together with the open source revolution in which communities of developers working on applications are modern developers' preferred choices, considering organizations focus on service-oriented web-based developments to refactor applications into standardized, reusable services that easily couple with business processes.

All this strengthens cloud development capabilities as seen in the PaaS offerings that have emerged over the past five years and that envision the core of modern application platforms, and, together with innovative development, DevOps practices, and low-code/no-code tools, they eliminate many of the productivity and workflow issues that held back application development in the past.

IDC sees this rapid and continuous deployment of applications and services helping companies address the hypercompetitive, real-time needs of today's digital economy, as seen in Figure 8.

FIGURE 8

PaaS Services Growth in Latin America, 2019—2025



Source: IDC Semiannual Public Cloud Services Tracker, 2021

How Customers Are Adopting MAP Components

Recent IDC surveys with developers and development managers have shown uneven but consistent adoption of various PaaS components evolving to MAP.

- MAPs offer monitoring and management tools that give administrators visibility into application performance, quality, and usage, enabling developers to address development life-cycle issues and ensure productivity standards are met. In brief, understand application health and performance to improve customer experience.

Modifying MAPs provides multiple advantages to developers since they offer essential components to serve fast-moving digital companies, including the platforms, security tools, automation, and life-cycle operations of applications and variety of tools.

Platform services offered through MAPs include benefits, such as cloud-native CI/CD, containers, and serverless technologies, as well as the following:

- **Accessible code bases.** Whether accessing an open source code from GitHub or keeping a proprietary tailored code, the ability to constantly update applications in shared repositories is key to ensuring quality in continuous delivery environments. In addition, the logic and business case that applications cover should integrate into the MAP to benefit future developers. The increasing volume of containers, microservices, and other required components adds additional complexity to the continuous delivery of workloads, same as the code reuse across enterprises and networks. MAP providers seek to provide further support to businesses regarding application development, delivery, and deployment.
- **Serverless architectures.** Allow developers to break free from the underlying infrastructure limitations. According to *IDC's PaaS Adoption Survey*, 40% of adopters responded that they regularly use or test serverless computing. On the other hand, MAP providers lighten the back-end infrastructure loads by managing them as a service in which critical infrastructure requirements, such as storage, authentication, database management, and upgrade, are addressed in the cloud. Thus, developers can focus on functionality at the application level, namely, the business logic.
- **API management.** Platform services allow developers to leverage API, which is an essential component of modern application platforms. They are online resources that provide indirect references to the functionality of other code blocks and allow access to other applications or databases. APIs have been widely adopted as gateways to functionality in a broad range of business and technology processes. They also serve to modernize legacy applications by providing modern interfaces for outdated back-end systems. Currently, 39% of API-centric organizations do more than 15% of their application development using modern application architectures, including microservices and containers. MAPs usually allow the development and implementation of APIs to take advantage of their integration capabilities, connectivity, security protocols, and business applications.
- **Containerization.** Thanks to its flexibility and speed of movement between platforms, containerization is an essential enabler for the next wave of infrastructure innovation and application deployment. Containers and Kubernetes are crucial to MAPs' success since they ensure application performance at scale in high-performance, hybrid, and multicloud environments. *IDC's PaaS Adoption Survey* shows that 15% of Latin America developers use public container runtime services. Today, MAPs support container deployments with various management and monitoring tools, including analytics, automation, and cost management solutions.

Application Life-Cycle Automation and Operations

Currently, MAP providers have pre- and post-deployment tools and solutions:

- **Automated provisioning and application life-cycle planning/management.** Modern platforms that use portable containers, often temporary, with data created in microservices require different capacities depending on the workloads' demands. Additionally, they facilitate DevOps initiatives by tracking and increasing visibility during application and asset creation, use, and eventual removal. The need to automate these processes increases in parallel with their complexity; these solutions increasingly use ML to improve application management.
- **Continuous integration and delivery.** The ability to build a well-functioning organization employing practices, such as DevOps or rapid application delivery with CI/CD, is critical. Continuous integration is when developers integrate code on shared mainlines multiple times a day.
- **Continuous deployment capabilities.** Constantly release updates, changes, or new features to end users automatically with virtually no human intervention. According to *IDC's PaaS Adoption Survey*, 22% of IT managers state continuous deployment as an essential feature of modern application platforms and consider it vital for audits and regulatory compliance, requiring close coordination with business guidelines through DevOps methodologies.
- **Continuous quality control through systematic tests.** The software testing process is key to evaluating applications and code to prevent bugs and compatibility issues amid related applications. Additionally, 47% assure they launch some software at least once a day, and 21% implement software several times a day, requiring highly automated methods to guarantee its quality.

MAPs offer a variety of developer tools, including connectivity environments and data services to:

- **Consolidate the latest development tools and traditional ones as well.** Ideally, developers should create solutions from day one since MAP includes many development work requirements, such as application integration, legacy extension, configuration management, and editing debugging.
- **Have application and data integration features.** *IDC's PaaS Adoption Survey* highlights the priorities to include in MAP. 30% of IT managers seek integration capabilities; another 21% are looking for configuration management capabilities; 20% are looking for tools to extend their legacy applications; and 16% are looking for editing and debugging capabilities within their platforms.
- **Support a wide range of databases.** Databases are no longer one-size-fits-all. Although relational database and nonrelational database management systems are still widespread and remain one of the best options for transactional environments, data repositories have evolved over the last 10 years, and relational databases are now just one of many options for various needs.

According to *IDC's PaaS Adoption Survey*, 27% of respondents stated they seek the ability to manage and leverage data resources through databases, data lakes, or other data resources. Today's cloud and digital environments have lighter databases built by and for the cloud and analytics. Modern development teams must be prepared to link, create, and maintain various databases and types of data structures.

TABLE 1

Major Vendors Delivering Modern Application Platform Services

Cloud Provider	Container Services	Serverless Offerings	Continuous Delivery Offerings
Amazon Web Services (AWS)	AWS Fargate, AWS EKS, Amazon ECS, AWS EKS Anywhere	AWS Lambda, AWS Step Functions	AWS CodeBuild/AWS CodeDeploy/AWS CodePipeline, AWS App Runner, AWS Proton
Google Cloud Platform	Google Kubernetes Engine	Google Cloud Functions, Google Cloud Composer	Google Cloud Build
IBM	IBM Cloud Kubernetes Service, OpenShift Container Engine	IBM Cloud Functions	IBM Continuous Delivery
Microsoft	Microsoft Azure Container Service	Microsoft Azure Functions, Microsoft Azure Logic Apps	Microsoft Azure Pipelines
VMware/Pivotal	Pivotal Container Service	Pivotal Function Service	VMware Code Stream/Pivotal Concourse
Oracle	Oracle Container Engine	Oracle Functions	NA
Red Hat	Red Hat OpenShift Container Platform	Red Hat OpenShift Cloud Functions	Red Hat Ansible Automation Platform
Salesforce	Salesforce Lightning Container	Salesforce Evergreen	Salesforce DX, Heroku Flow
SAP	SAP Cloud Platform	SAP Extension Factory	SAP Cloud Platform
ServiceNow	Now Platform App Engine	NA	Now Platform

Source: IDC, 2021

Modern application platforms continue to grow, offering developers more tools and services to build and deploy applications quickly. As enterprise workloads, data, and processes migrate to the cloud, integration and orchestration also evolve and are currently implemented in MAPs.

Therefore, MAPs will need to offer the following features to support hybrid and multicloud environments:

- **Advanced data and application integration capabilities.** MAPs are inherently designed to induce multiplatform, multilanguage, and multisystem environments formats and nuances commonly used in modern businesses. MAPs must support various user requirements, including developers, operations teams, analysts, power users, and managers. This is

especially critical for companies building DevOps and agile teams for continuous integration and delivery of solutions and services.

- **Strong partnership ecosystems.** MAP providers will need to nurture partnerships with larger platform providers to ensure they have the tools and systems business developers and operations required by teams. This guarantees access to a combination of tools that best suit the application under development.
- **Support to orchestrate business processes.** Development and delivery do not happen in silos; instead, those activities must align with businesses and their dynamic requirements. MAPs must orchestrate business processes in all business environments, incorporating processes tied to facilities and cloud-based applications and data.
- **Event-driven architecture.** These architectures use events to trigger and communicate between decoupled services commonly present in modern applications built with microservices. An event is a change in the app state or an update, such as an item placed in a shopping cart on an ecommerce website. For further information, see the following studies: *Worldwide Integration and API Management Software Forecast, 2021–2025* (IDC #US45412520, December 2021) and *How Much Has Codeless Development Software Been Adopted to Support Automation and Integration* (IDC #US48463621, December 2021).
- **Self-service and no-code/low-code development.** Given that low-code (requiring professional developers and exclusively for internal apps) /no-code (does not need professional developers and a with a few tools meant for production, public applications) development allows developers/users to drag and drop application components, connect them, and create mobile or web apps, MAP is accessible to users beyond the IT department. It offers services that allow end users to create applications, either as APIs or querying data using tools that eliminate the need for technical skills. Additionally, MAPs must support "security measures" behind these self-service capabilities to ensure security, compliance, visibility, monitoring, and compatibility with the business environment.
- **Support quick API creation and deployment.** MAPs should provide an easy-to-use environment for developers and end users to create, implement, and support APIs. This includes interfaces and tools that allow the extension of back-end processes, as well as access to functions from the entire network.
- **Coexist with other existing application environments.** MAPs must integrate with highly diverse business environments, many of which operate in batches and real-time processing. MAPs must support existing infrastructure, as well as data messaging, integration, capture, and taxonomies.

Serverless Approach for Application Modernization

Serverless computing is the current cloud computing avant-garde, providing capabilities that increasingly define enterprise cloud services consumption to accelerate their applications modernization. The term serverless does not mean the absence of servers but rather the provisioning and management of servers as a service. It should also include scaling and paying for usage/value pricing.

Cloud providers now offer opportunities, including platforms and resources for competent developers, datacenter operators, and business users who seek initial simplicity to design, develop, and deploy applications quickly and without the hassle of configuring or managing underlying resources.

Although cloud providers offer serverless computing as separate services from instance-based ones, their offerings share many of the same functions and features. Most solutions built with a serverless approach and architecture require other services, such as API management, streaming, and storage.

Today, serverless will likely evolve as the dominant cloud consumption model for businesses as they adopt minimalist DevOps or even the no operations (NoOps) approach.

The challenge for cloud providers is to expand their serverless offerings while maintaining openness and access for customers who require more customization in their environments. However, portability across standards will help overcome this hurdle.

Serverless technology is likely to continue to evolve and lead the cloud consumption model, given several factors:

- Market changes are serverless drivers. IT staff today need more autonomous and back-end managed environments. With time, companies will continue to adopt this approach to technology management.
- Serverless is changing the cloud economy. Modern investments are focused on the provision of business services. Additionally, the serverless consumption model is a usage-based resource billing. Companies can activate applications for specific use cases and services instead of maintaining long-term apps; this way, they can take advantage of investments in the back-end infrastructure.
- Serverless can overrun the already growing container and Kubernetes space, although not necessarily mutually exclusive. Serverless may be highly valued for being lightweight, portable, and platform independent, but they still require administrative work, such as applying security fixes and other forms of manual intervention by developers or operations teams. It is different from serverless that provides unmanaged environments and supports new applications faster.
- Since serverless is evolving to more than only function as a service (FaaS) or back-end-as-a-service capacities, it is rising to a strategic role in business IT. Consequently, it encourages new development and deployment flows in modern software-driven enterprises and provides a dynamic and flexible enough application infrastructure to instantly switch to business needs without calling for IT department interventions, enabling IT professionals to elevate their roles and participate more actively in LOBs.
- Serverless offerings are essential for DevOps operations: delivery, deployment, security, scheduling workload management, and data backup management. DevOps is predominantly managed through cloud provider automation, which means significant long-term reductions in technology investments. DevOps may even lead to automated software environments that they may need few operation works getting closer to an emergent concept, such as NoOps, which, despite being a highly automated environment, still requires operation efforts.
- Serverless and low-code/no-code trends converge. It is an environment that supports the concept of applications created in "LEGO block" style, which are easily assembled and disassembled as required without needing technical knowledge in operational or development methodologies.
- Serverless event-driven services that enable customers to run code in response to events from hundreds of natively integrated SaaS sources could eventually be part of the leading cloud offerings. Since they all consume the same resources, all the major cloud/PaaS offerings may evolve toward serverless models, such as Amazon Lambda, Amazon Aurora, Amazon DynamoDB, and Amazon EventBridge, in the coming years.

- Proactive PaaS providers will introduce more serverless capabilities within their platforms while providing customization capacities.

Serverless is a must for event-driven applications. Applications that automate processes at the edge, driven by high-speed, low-latency bandwidth, are growing. The ability to respond to messages from the IoT sensor and data processing at the edge are becoming very popular use cases in the serverless approach.

Container and Cloud-Native Applications

Digital innovation, data-driven business models, and modern cloud-centric infrastructure are the top 3 priorities for Latin America organizations looking to build digital resilience.

IDC predicts that production-grade cloud-native applications, which were just 10% of all applications in 2020, will have risen to 70% by 2025 given the adoption of technologies, such as microservices, containers, dynamic orchestration, and DevOps.

Based on IDC Public Cloud Tracker data, 2020, the Latin America software-defined computing software market, including containers, estimated to be US$1,530 million in 2020, is projected to have grown to US$2,869 million by 2025 with a CAGR of 29.3% from 2020 to 2025.

Containers initially intended for new cloud-native applications are inherently new and lack previous evaluations. However, Latin America companies are now assessing them as classic tier 3 web "lift-and-shift" applications, Java applications, or any payload of database-dependent work. Considering the containers' speed, efficiency, and practicality when running cloud-native applications, companies are weighing them to address the priority transformation needs of existing workloads.

According to *IDC's Multicloud Survey 2020*, companies believe that security, multicloud workload portability, automation, infrastructure modernization, and containers are the key priorities to consider accelerating application delivery.

Modernizing the main application through containers can offer benefits, such as:

- Support digital innovation and agile development needs.
- Give new digital life to legacy applications.
- Support migration strategies to the cloud.
- Make more efficient use of resources.
- Make data and applications portable to enable hybrid and multicloud cloud environments.
- Move to fully automated implementation and operations to eliminate slowdowns and errors in manual processes.

Interest in containers is evolving to the next level. IDC believes that innovation in adjacent areas, such as storage and security, are key to driving adoption.

Business Benefits and Transformational Use Cases Experiences

Understand That Modernization Is an Ongoing Process

Currently, only a few legacy applications have had 100% of their codes refactored. Companies should acknowledge modernization as a phased, gradual, and iterative process that does not involve some radical transformation of legacy applications into digital ones; instead, it is a sustained journey of processes and applications modernization, sometimes from legacy to the cloud and others directly created in the cloud.

As such, organizations should identify the modernization-related milestones that help them assess the progress of their modernization initiatives for specific digital assets. Another benefit of modernization milestones is controlling its next phase initiation timing.

Successful Cases in Application Modernization Initiatives

Despite the challenges, DX acceleration initiatives are becoming commonplace in Latin America companies in all industries in 2021, although some are faster than others. DX acceleration mostly depends on the businesses' strategic and technological maturity. They rely on their ability to find solutions to creating automated processes and monetizable services using IoT, AI, and ML to become more competitive in their markets.

IDC has identified different behavioral patterns toward the DX in Latin America; major buyers are mostly in the financial, telecommunications, discrete manufacturing, and government industries. However, this does not mean that they are the most advanced ones.

For companies that focus on modernization, results quickly become evident:

Banco de Bogotá, New Digital Accounts, and Multiple Benefits for Customers

The bank has managed to respond to the market, launching the first 100% end-to-end digital account in the region.

Currently, 50% of all savings accounts are digital, and its new innovative strategies and technologies have allowed it to launch new solutions to the market quickly. Additionally, projects that used to take 12 months can now be delivered in as short as three weeks.

Benefits

- Once the project is completed, the benefits for customers are immediate.
- The bank employees can provide better services and answer customers' questions faster and more accurately.
- There is significantly enhanced security.
- The system runs faster and smoothly; thus, customers have a satisfying digital experience.

Next Steps

Bank of Bogotá intends to invest in and continue with its DX.

Oncoclínicas, Setting a Remote Office in a Matter of Days

Created in 2010, Grupo Oncoclínicas is a Brazil company, currently one of the largest and most respected specialized groups in oncology, hematology, and radiotherapy in Latin America. Grupo Oncoclínicas has 67 units and about 3,000 employees in 11 states with specialists in oncology, radiotherapy, hematology, and bone marrow transplantation. It operates based on multidisciplinary teams, complementary care, and the more advanced availability and individualized treatment.

Given the isolation mandates resulting from the COVID-19 pandemic, Oncoclínicas created a remote work model for its employees. The group accomplished this tremendous challenge in just three days with no impact on operations and service.

Benefits

Oncoclínicas was able to put its 3,000 employees to work remotely with around 300 of them working in the back office, an ability the company could enable in only three days. The change to new technology has allowed them to place all their workloads in a remote environment, integrating their internal management systems, business intelligence (BI), and others. By doing this, employees have been able to access and create reports from home. The user access and activities control, especially for the back office and call center, has made it possible to balance VMs and prioritize needs.

Next Steps

The group's IT team is already planning to replicate the structure and get the organization wholly digitized.

Rappi, a Colombia-Based Start-Up

Founded in 2015, Rappi is Colombia's first tech start-up valued at over US$3.5 billion. It offers on-demand, last-mile delivery for almost anything in nine Latin America countries.

In the beginning, Rappi built a traditional monolithic application. Although this infrastructure served well at first, its engineers soon determined that it needed a database platform that could support a more flexible approach driven by microservices and facilitate the pace of innovation required to compete in the on-demand delivery business. Additionally, they decided that part of their microservices workload should be compatible with a document store. These decisions led them to modernize their database strategy and migrate to one in the cloud.

Benefits

Once the migration was complete, the benefits were immediate. Currently, Rappi has 2,000 different databases in production. Rappi's new model allocates a cluster for each of its nine business lines per country and can handle the exponential growth of clusters with just two engineers. They found that they could perform the same tasks with much more stability and much less code. Rappi's largest database cluster of five instances took two weeks to migrate and significantly improved performance and efficiency.

In fact, Rappi has not experienced any disruptions since then, and the latency for ranking queries has dropped to 80ms. New databases require less maintenance, freeing the Rappi IT team to focus on value-added activities that help move applications forward.

Next Steps

Rappi assures it will continue to invest in modernization initiatives.

Natura, a Well-Architected Framework Review

Natura is part of the Natura & Co group, made up of Avon, The Body Shop, and Aesop, and is the fourth largest cosmetics company globally with operations in more than 70 countries.

Natura & Co conducted a Well-Architected Framework Review (WAFR) of the new global sales platform (GSP) for beauty sales consultants to support Natura's operations internationalization and business growth plans. Their platforms comprise three systems — registration, management of the commercial model, and direct sales relationship — and provide digital services to consultants and sales force. The objective was to offer them a new extraordinary and personalized shopping experience, promoting digitization, taking advantage of the productivity and profitability of their Latin America network.

Natura GSP was born with an architecture oriented toward microservices and events with large-scale cloud components with scalability and agile launch potential to serve the process of capturing consultants' orders.

Benefits

After the first implementation, the Natura family expanded, and they concluded that it was worth having the support of a partner focused on the group's growth expectations in the region during the platform's comprehensive optimization.

Performance evolved significantly, without functional losses, and is responding very well to higher use volumes. The overall resilience increased, exposure to faults decreased, and monitoring became even more preventive. These new capabilities parallel the implemented functional evolutions, aiming to leverage relevant features for consultants and the sales force.

Next Steps

Natura's GSP review project was so successful that the company decided to review other critical platforms, such as the Global Commercial Platform (GCP) and Global People Platform (GPP), which are part of the ecosystem that enables commercial services for Natura's consultants and sales force in Brazil, Latin America, and Malaysia.

SkyAlert, More Alerts in Less Time

SkyAlert is a technology company that contributes to timely alert millions of people living in vulnerable areas, promoting a culture of prevention against natural risks.

To provide companies and individuals with the appropriate tools to prevent them from the seismic events, it seeks new technologies in the cloud to integrate IoT into services in addition to implementing an efficient service to send alerts to millions of users in a few seconds, helping to save lives in the event of earthquakes.

SkyAlert has an application for early alerts on seismic events in Mexico and some United States regions, offering solutions to companies and individuals. They have more than 3 million registered users who trust the alert service.

Benefits

The migration and modernization of its application helped alert messages reach millions of users in eight seconds when they used to take up to 20. In addition, users can know the earthquake's location and duration.

In June 2020, SkyAlert gave users more than 120 seconds to take safety measures during the earthquake in Mexico City. They managed to communicate to users up to 20 seconds before other alerts blared their horns on the streets.

Containers give the business the ability to scale whenever needed by optimizing budgets quickly.

Next Steps

SkyAlert believes there are still many opportunities for improvement and aims to send alerts in less than 4 seconds.

ADVICE FOR THE TECHNOLOGY SUPPLIER AND BUYERS

We are witnessing the evolution toward a new normal. Change is inevitable, and we undergo substantial cultural and mindset disruptions in the society and companies are leading us to transform our social and business models.

At the business level, rationalizing, modernizing, and transforming an organization's IT portfolio with modular enterprise applications is a journey that implies an innovative mindset from the IT department, management board, and the operational managers.

IDC provides some advice to companies digitally transforming and are ready to embrace the modernization path:

- IDC suggests adopting a new people-centric culture from the top management and creating DX boards to guide teams to embrace the cultural and mindset transformation with agile strategies.
- Assess your applications one by one and align them with the commercial demands. Locate the gaps and decide what apps are needed to solve unique business challenges while automating competitive advantage. Seek to automate business processes that currently consume resources, hold your organization back, or are the most significant pain cases.
- Select the applications that may remain on premises and those meriting modernization and migration to the cloud to optimize the commercial processes and fulfill customer demands.
- Consider open, flexible technologies enabling the business to harbor applications and provide maximum flexibility to optimize and consolidate legacy workloads to an open and flexible platform so they are well-positioned to capitalize on future innovations.
- Look further than your current needs and consider the types of workloads you may use in the future, instead of focusing on requirements posed by the workloads currently in use, such as databases or productivity workloads.
- Perform a systematic assessment of a portfolio of legacy applications that examine attributes, such as application complexity, application architecture, security vulnerabilities, business benefits of digitization, the technical complexity of specific innovation pathways, and modernization-related risks. The goal of the assessment should be to provide guided insight into the level of effort required to modernize specific applications within a portfolio.
- Assess the relevance, cost, and complexity of discrete modernization methodologies as a means of making informed and strategic decisions about the best path forward for your legacy application portfolio. Make further assessments that typically leverage static code analysis tools that appraise the architecture, complexity, and security vulnerabilities within applications.
- Understand that modernization can occur through several modalities, pathways, and methodologies, which are not limited to refactoring or rewriting applications from scratch. Rehosting and replatforming are other two modernization modalities often used as part of a phased approach to digitization wherein applications are initially migrated to the cloud and rearchitected at a later stage.
- Develop a strategic road map for modernization. Companies should create a strategic vision for modernization within their organizations, which specifies which digital assets need modernization, and, correspondingly, what method is most appropriate for each specific app.

This strategic vision needs to prioritize the modernization of specific workloads directly related to their business processes.

- Consider refactoring could not always be the right approach to legacy applications due to its complexity and commercial priorities. Define the best approach to modernization modalities; do not think of modernization as a technological process that begins with rehosting or replatforming and culminates in refactoring.
- Assess the automation of incremental execution of modernization strategies to portfolios of applications. Such automation might be as simple as integrating project management tools with existing modernization initiatives and subsequently automating the delivery of notifications and messages regarding the need to progress to the next phase of a modernization initiative.

As the world accelerates toward a digital economy, organizations need to scale and innovate quickly. Agility is essential to stay competitive in this new normal, thus application modernization is crucial to ensure an efficient and effective approach to the latest commercial communities. The key is to let data lead the way toward success.

LEARN MORE

Related Research

- IDC Latin America Public Cloud Tracker Services, 2021.

Synopsis

This IDC Perspective indicates that organizations need to scale and innovate faster as they follow the digital transformation trends. Agility is essential to stay competitive in this new normal, thus application modernization is crucial to ensure an efficient and practical approach to the latest commercial communities.

"As the world accelerates toward digitization, organizations need to scale and innovate quickly. Agility is essential to stay competitive in this digital-first era as cultural people-centric changes affect organizations' application modernization strategies; this is crucial to ensure an efficient and effective approach in a digital economy," says Alejandro Floreán, Research, and Consulting VP, IDC Latin America.

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

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