White Paper

# Intelligent Automation for High-Velocity Business Process Testing to Enable Optimization

Sponsored by: Worksoft

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## IDC OPINION

Business processes drive software execution. And enterprise software drives global business. By expressing and reflecting core content and workflow, business process flexibility can dramatically increase corporate responsiveness to changing competitive environments. At the same time, visibility into digital business processes and their quality is often problematic for companies, even though both are critical for adaptability and successful execution.

This white paper discusses the challenges faced by companies in adapting business processes to dynamically changing environments while maintaining quality. Software can enable agility, but this relies on both the flexibility and the reliability of underlying business processes. DevOps and multiplatform deployment are becoming increasingly intertwined with business process quality as well. In that context, the following points must be considered to help evolve an effective strategy:

- Increasing use of digital technologies (cloud, mobile, analytics, etc.) coupled with a high velocity of change drives the need for intelligent automation of business process quality.
- Businesses need to ensure that their critical processes work 24 x 7 x 365 across all required devices, even when underlying applications change.
- Companies are exposed to significant risk of business disruption if critical processes aren't tested frequently – public software failures are becoming more and more commonplace, and it's not merely about security.
- Proactive, continuous quality management for key business processes across multiple applications is increasingly a necessity for most organizations.
- Companies often use manual approaches for testing and quality – methods that are ponderous, error prone, brittle, and costly. It is simply not possible to achieve the needed speed and accuracy with non-automated approaches, particularly for business processes. Dynamic, high-velocity automated testing is key to avoiding the business disruption, lack of visibility, and project backlogs created by manual methods.

## Existing Approaches and Challenges

There is an explosion in demand and velocity of change for what IDC calls "multimodal," or cross-platform, software deployments that can enable company success or failure. These deployments rely on agile, high-quality business processes. This white paper discusses current views about business process quality management and the consequences of lack of visibility and testing to evolve businesses effectively. Establishing automated strategies for business process testing is becoming increasingly important. The intent of this white paper is to explain how companies are shifting from the downsides and challenges of non-automated, manual approaches as well as how to transition (which requires process and organizational change). The document provides additional context through case studies on the use of Worksoft's test automation capabilities and product portfolio.

## SITUATION OVERVIEW

Demand for business process quality and optimization is increasing as organizations must respond to the velocity of changing competitive pressures, compliance issues, and deployment across a range of platforms. Previously, and all too typically, one-off manual testing that did not encompass broader quality approaches had limited visibility and straitjacketed organizations. (Companies today require both speed and quality for end-to-end adaptability and multimodal deployment.)

IDC has observed a series of related issues as a result of user inquiry and discussions with organizations engaging in business process quality strategies and automated, "end to end" testing:

- **Development testing versus business process testing.** IDC sees automated testing playing a critical role in agile and DevOps life cycles for both development preproduction and moving beyond into post-deployment and maintenance with ongoing change and service requests. Agile testing and incorporation of quality automation that also encompasses business process testing end to end can enable speedier deployments with improved responsiveness and higher quality.

  Companies that believe that testing ends with development run significant risks and must increasingly evolve beyond that approach to carry testing through to deployment and maintenance. Agile development without agile testing results in iterations on low-quality code. The key is to shift work processes in a way that incorporates agile test automation, resulting in effective software and business process quality management. Cross-platform deployment and dynamic change are also demanding changes in how businesses go to market. This is both a disruption and an opportunity to drive modifications and a DevOps approach that includes agile testing.

- **Companies need business process visibility.** The complexity of today's competitive enterprise landscape demands business process understanding, automation, and analytics. All too frequently, businesses lack visibility into even the most basic business processes and workflows. This understanding is required to enable optimization and drive competitive advantage. This becomes even more problematic with globalization and digital transformation. Without business process information to enable business process quality and understanding, businesses fail. And how can you effectively document and test your processes if you don't know what they are? Without automation, documentation alone can take hundreds of hours of effort by multiple staff members across an organization.

- **The shift to cloud applications.** The rapid pace and adoption of applications in the cloud mean that while companies still own the processes for their business, they increasingly do not own the applications or changes to those applications. ==Companies have less and less control over how and when their software portfolio landscape is impacted in these cloud environments. In that context, organizations must be continuously responsive to change== while dynamically updating and maintaining the integrity of their business processes, which is possible only with automation (given the rigidity, inefficiency, cost, and lack of visibility with manual approaches).

- **Collaboration is essential.** Teams across the enterprise must communicate effectively to enable business process evolution and quality that map to dynamically changing business needs. Fractured, siloed organizations will not be able to provide the coordination and collaboration needed for visibility or to complete business process testing coverage. Business users, analysts, and development and operational teams need to communicate dynamically and seamlessly to share information. Business change along with lack of accurate, updated information across groups can lead to stalled projects and poor quality – as well as outdated processes and business process failures.

- **Complexity of today's processes.** ==Why is testing more important than ever? Companies and the software on which they run their businesses must be constantly responsive to changes across the board.== Technology change, shifting platforms, and dynamically changing business and competitive pressures create a combined level of challenge and complexity that also demands automation and visibility. A successful and secure business process quality strategy can be a key link between the business side, development, and deployment.

- **Typical cultural, organizational, and technology barriers and strategies for success.** People are often reluctant to change their behavior and incorporate automation consistently and in new ways. How do business users overcome disparate approaches and inadequate coordination for business process testing? How do they move through to a successful transition culturally and organizationally?

  Identifying the key benefits of automated capture of existing business processes; visibility into real, current processes; and analysis to identify areas for improvement with regard to quality and testing coverage are first steps. Establishing success, cost savings, and the proof points with successful business outcomes and faster response times can help support the transition. The necessary functional capabilities to address user needs include the capture of business processes for visibility and the ability to test and manage business process quality.

## A New Approach: Automated Business Process Discovery and Testing

Establishing an automated strategy for business process quality can enable companies to respond quickly to emerging business opportunities and help ensure quality execution of critical business needs across key platforms (e.g., mobile, social, Big Data, cloud).

It is critical to address process and organizational changes at the same time to develop and establish an effective business process quality strategy through automation. ==Automation can drive a simpler, faster, less costly way to avoid business disruption and enable adaptive, dynamic responsiveness to changing business and technology environments.==

Discussions with IDC's clients and organizations engaging in this type of approach made clear that there is a key need for businesses to be able to manage quality well while responding to the exploding demand and velocity of cross-platform software. In this context, we discuss solutions from Worksoft and several customer examples of companies that have benefited from adopting strategies for business process quality.

## COMPANY OVERVIEW: WORKSOFT

Worksoft, based in Addison, Texas, had around 130 employees and 310 customers as of 1Q16. Growth has been driven by its SAP-focused, intuitive, scriptless quality assurance solutions. Worksoft's differentiators are software products for quality testing that do not require programming, are business process centric, and focus on efficient business process capture. While Worksoft's primary innovative focus has been on SAP environments (including Solution Manager integration), Worksoft also supports other technologies and non-SAP systems. These include ecommerce Web sites, Oracle, salesforce.com, Siemens Teamcenter, Manhattan, IBM Maximo, SuccessFactors, HTML, Java, and .NET. Revenue is increasingly coming from the need to validate these non-SAP applications, complementing the company's existing business.

Worksoft provides software for functional testing and automated business process validation. Worksoft Certify helps validate that business processes and their variations work end to end across applications, even when changes are made to the underlying enterprise systems.

Worksoft also automates business process discovery. Worksoft Analyze provides a visual format to help companies understand their business processes by capturing current, real-time views of these processes and their workflow within an organization. This in turn can be used for process analytics and optimization and compliance documentation and to help support automated business process validation.

Automating business process discovery and testing can allow faster innovation, flexibility, shorter IT project timelines, and higher quality assurance in a complex landscape.

Worksoft products are relatively easy to use by nontechnical users to help provide ROI and to enable collaboration across business stakeholders, testers, and developers. Worksoft's automation is responsive to changes in underlying enterprise applications and business processes to help extend value beyond initial projects. These products also provide context for both SAP and non-SAP applications that integrate and coordinate with SAP for more complex quality support across related application portfolios.

Worksoft products are Worksoft Certify, Worksoft Analyze, Worksoft Performance, Certify Data, Certify Impact, Certify Interfaces, Certify Business Process Procedure (BPP), and Certify Execution Manager.

In 2015, Worksoft delivered Worksoft Analyze to complement its Certify portfolio and to help business users efficiently capture business process flows to visually create automated business process validation and analytics. A cloud-based solution, Worksoft Analyze provides business process capture technology that helps users automatically document and better understand end-to-end processes with visualization and analysis capabilities. Examples of the ways in which Worksoft Analyze works include the ability to:

- Identify transaction paths and flow by execution count for SAP
- Identify variants of business processes and the reasons for them
- See business process flows and variants by execution frequency, including workload statistics data
- Identify slow-running business processes that can consume both business analyst (BA) and system time
- Help prioritize investments in quality assurance and automated business process testing based on the use frequency or risk of various transactions or business processes

## Automation Case Studies

IDC spoke with several user references, including a medical diagnostics and life sciences company, a telecom company, and a food retailer. These users were seeking efficiencies, faster and higher-quality application deployment, and business process visibility and testing.

### *Diagnostics Company Implements Quality Changes for SAP Deployments and Lowers Costs*

A global diagnostics and life sciences company (with about $2.5 billion in revenue and 8,000 employees) had grown through acquisitions and was seeking to standardize between 30 and 40 disparate ERP systems to SAP. The complexity of its SAP deployment was challenging. For instance, in Europe alone, there were 32 company codes, a complicated structure for manufacturing and distribution, and sales across continents. The company had business and compliance issues that required keeping subsidiaries at arm's length, all of which made testing complex and problematic.

This company therefore chose to focus its ERP testing on business processes rather than forms or enhancements, looking at end-to-end flows. Because the company didn't have the resources to test every combination of organizational elements, it wanted to test a representative transaction flow and then run the automated tests against other combinations, which were helpful for its warehouse, manufacturing plants, and customer needs under SAP.

Initially, teams performed all their testing manually, which was very expensive as well as resource and time consuming and didn't provide the coverage needed. (The company had 150 people testing per day for three six-week test cycles, costing around $500,000 per week.) When the company went live with an initial deployment, it was so problematic that the company had trouble shipping products and getting them into customers' hands. Many defects hadn't been found in testing, so the company had delayed shipments, annoyed customers, a resulting drop in sales after go live, and some lost revenue (but not to the extent that it affected overall financial results). It was a serious issue. The company then had to spend more time testing, which lengthened deployment time – but the testing was still manual.

As a consequence, to increase efficiency and deployment success, the company evaluated SAP-specific automated tools. It engaged in a comparative assessment over three days to validate the solution from the tool perspective, automated sample manual tests to demonstrate data input visibility and increased coverage, and chose Worksoft Certify.

The company purchased Worksoft Certify automation because of the strength of its SAP-specific capabilities, business process support, and testing. The company began using it initially with a single team doing EDI, to test those connections and as a proof of concept, which resulted in a successful deployment. The focus for the next broader initiative was to cut costs, reduce defects in production, and increase efficiency as it worked on a global SAP deployment for manufacturing that included Europe (and would form the basis for final deployment).

The initial implementation of Worksoft was straightforward and took one staff member a few weeks. To establish consistent use of Worksoft that also incorporated key business process content, the teams brought in Worksoft services to help with adoption and automation and then added staff from a systems integrator (SI) knowledgeable about the company's business and SAP deployment to complement the Worksoft Certify automation team. The SI service team was familiar with the organization's core business processes, such as procurement and logistics, which were part of this

organization's SAP deployment. They succeeded in building a library of tests that could run continuously with over 160 integrated processes each night.

The most important Worksoft functionality for the teams has been the ability to change business processes and have the software update related tests pretty quickly. The company is finding that it doesn't have to spend a lot of time on maintenance, which is now in the 10-15% range (which is respectable for a test library this size). Being able to run tests all night every night is of huge value to the company. The teams can see immediately if a change that breaks something that might cause a business disruption is introduced — and avoid the problem in advance. Worksoft's ease of use lets the company quickly develop tests, easily maintain the tests, and run the automation in an unattended fashion. And the company can change a business process and be confident about the outcome. For its production SAP system, there is now a life-cycle process for changes that any team wants to make. The team can implement the change itself, but before the team is allowed to move it to production, it has to have a clean, automated test run.

The company's procurement and other teams observed cost and other efficiencies as a result of the Worksoft adoption compared with prior manual approaches. Previously, for instance, when the company had to test a form after making tweaks to it, manual testing could take a single person upward of a week until he/she could implement a new feature (taking staff time from other activities and delaying deployment). Now the company can run comparable tests in about 20 minutes after changes are made to help make sure that nothing is broken. The impacted groups have become huge fans because the results with Worksoft are key to the business analysts and others in what had previously been an extremely time-consuming quality assurance process.

One of the benefits of such a large SAP deployment is significant cost savings, given the funding allocated for SAP. Once the executives saw how much they had spent on manual testing and the substantive decreases in human resource and financial allocation — all with faster access to their business applications and shortened timelines — executive support for Worksoft automation was secure.

Because business process visibility and analysis have been ongoing issues, this organization is now looking to implement Worksoft Analyze as a follow-on initiative to Worksoft Certify. While the company has pockets of knowledge and individual people who know a slice of the business, it expects Worksoft Analyze to help with business process quality and provide "end to end" understanding of current processes.

Additional plans for a follow-on project include the use of Worksoft Certify for end-to-end testing of salesforce.com (combined with the use of Selenium for Web test automation).

Quantifiable success includes significant cost savings with increased efficiency compared with manual testing, catching failures missed by initial tests (to avoid downtime on the shop floor, for the warehouse, and for client delivery). Faster delivery translates into revenue benefits as well as savings on resources.

Organizationally, although this company doesn't have a separate center of excellence (COE), it does have a team that provides a shared service to testing project members with standard procedures, required artifacts, and guidance on how to approach test automation.

One of the challenges faced by this company's IT organization is the need to be faster. As the speed of business changes, the company is moving applications to the cloud (for instance, its sales team is cloud based and uses salesforce.com). When getting updates from cloud vendors every quarter, whether the company likes it or not, the teams must react quickly to the demands of the business in terms of managing new capabilities. At the same time, traditional IT sees itself as protecting the

business with ITIL and change control to make sure it doesn't break anything, and it is not geared toward enabling changes, typically.

With quality automation, this company feels that its teams can now start to do both. It is able to move faster while protecting the business and making sure the changes have positive impact. The company is able to test more often while maintaining the known state of the system and determining what's working and what's not. The only way it has been able to speed up its deployments while maintaining quality has been through test automation.

This company has now baked quality into its SDLC with Worksoft automation. If the company changes a business process or makes a design change, it puts it in the queue to be automated, adding it to the version library that is executed every night. So it is confident that these changes will not break anything or disrupt business as it implements technology changes and deploys innovation.

## *Telecom Provider Improves Efficiency for Core Financial System*

A Fortune 50 telecom provider was seeking to improve the speed, efficiency, and quality of its SAP releases. Given compliance needs such as Sarbanes-Oxley and financial reporting timelines, there are only certain times of the year when the company can upgrade its ERP systems. Time and resource savings are important not only to lower costs but also to compress deployment of the company's SAP releases into these narrow schedule windows. Also, since ERP systems are very integrated, making a major change requires regression and integration testing and a fair amount of data conversion. The benefit of a unified ERP system is that everything is colocated together, but this also means ERP upgrade projects have significant testing requirements and a very long test tail, typically.

Worksoft automation has helped this company make sure that test cases are documented properly. Previously, test scripts were a coding deliverable that nontechnical end users and operational staff could not create easily, so they would "throw bodies at the problem." This approach was ineffective because the test teams needed to collaborate with the business to determine the test requirements for core business processes. With Worksoft Certify, business users can automatically capture core business process information that can efficiently be passed on to the testing team to execute as functional tests.

The ability to run test scenarios as well as have them work and tell the teams what's broken is invaluable for this organization. With Worksoft automation, the team has experienced a 30% efficiency gain and gone from three cycles of ICT to two. The company is able to do this with fewer people, lower costs, and faster time frames for the release. It can also fit regression and user acceptance testing on top of the last IT cycle in a more serial approach.

Recently, the company started hiring staff for its internal COE, which it thinks will improve efficiency further since optimal use of Worksoft Certify will be through additional dedicated, trained resources. The COE will help in two areas:

- While there's no coding involved with Worksoft, there is a learning curve. The company expects the COE to help save time in knowledge transfer across the business.

- When the company tries to do a strategic project in the middle of a release, the strategic initiative can sometimes get pushed off because testing has been something that someone does in addition to other job functions. The COE and automation will free staff to complete more strategic projects.

The company has been very happy with the result. Training has been very important, along with consistent usage and contractor support. A key benefit is the fact that end users could capture actual business processes by merely going through their normal activities. Also, Worksoft Certify relates to the business process hierarchy in SAP's Solution Manager (Solman), which the company uses to manage SAP projects. (There is a process area for objects that are connected to the Worksoft automated testing tool, which is important for the company.)

Another big benefit of Worksoft for this organization is that it has integrated automated functional testing with its defect tracking tool. It can take a screenshot and have the defect documented. The product can be set to run multiple test cases, and the company can refer back to see what happened and provide a screenshot of the defect to IT, which is very helpful.

Overall, Worksoft has helped the company ascertain defects to find problems quickly. It lets users know that there were defects in a specific business process and quickly learn that the process has problems.

The teams have used Worksoft Certify primarily for SAP with great success and are in the process of trying to push the product out for PeopleSoft. The company is also interested in integrating Worksoft with its Infor time-tracking system and working on the quality of the company's regression test bed as well as increasing the breadth of test coverage.

For other companies evaluating comparable products, the question that needs to be asked is: What does the tool have to have to get your business-side people to feel sufficiently comfortable that they would actually use it? In making a decision for automated tools in this area, a company also needs to understand what the testers are doing and what their issues are and ensure that the tool actually helps. One challenge when setting up Worksoft (or any new tool impacting an ERP system) is building roles appropriately and establishing who has what kind of access (of key importance for ERP implementations in areas such as financial journal entry creation, for instance). Another aspect on which to focus is to get support for what's needed – in this case, training was key. The company has been successful in making a transition using Worksoft automation and has seen 30% improvement in efficiency, as stated previously.

### Major International Food Distributor SAP Quality Goal: "No Defects in Production"

Two years ago, a large EMEA-based international food distributor had limited or no testing process frameworks in place for SAP and was doing all testing manually, to the extent that it was doing testing at all. Since that time, this company has evolved to an overarching quality approach that incorporates automated testing from Worksoft with Worksoft Certify and is moving to incorporate Worksoft Analyze for business process discovery. Automation has enabled time and cost savings with speedier, higher-quality releases that enable the organization to execute more effectively as a business, resulting in increased revenue and business efficiencies.

The company has two major releases of SAP per year (covering HR, CRM, and more), along with smaller monthly drops. For past releases, it had been doing quite a bit of manual testing. Two years ago, there was no clear structure for testing within the organization, and that resulted in significant problems, with defects and delays in production releases. With the help of several large systems integrators, the organization then created a testing road map that set the stage for a goal of "no defects in production" and new methodologies for test management and quality. As part of that process, the organization evaluated Worksoft Certify (along with two other products) and adopted Worksoft, which is now used for all monthly and semiannual SAP releases.

With the help of systems integrators, the company has built up a significant portfolio of automated tests with Worksoft Certify and now sees benefits in terms of efficiency, time to deploy, and improved quality. It has benefited from a close partnership with Worksoft. The company also has a pilot in place to bring in Worksoft Analyze (on which it has already been working collaboratively with Worksoft) later this year.

The team is using SAP Solution Manager as a repository for the test cases (which is integrated with Worksoft), and the primary focus is regression testing with Worksoft rather than unit or integration testing. User acceptance testing (UAT) is done manually by users, and then Worksoft is used for a final end-to-end process test to check that the entire business process is working appropriately.

Success for this organization is visible in improved business process execution, as well as testing methodology and tool processes. Even small changes inside business processes are handled by Worksoft, which also supports referential integrity. The benefits include reduced cost, faster and more efficient deployments as mentioned previously (although the company would like it to take less time to capture business processes), and the ability to quickly execute test suites and then rerun and reuse them in subsequent test cycles. While it used to take three days for one test suite to run, the company is now able to run multiple test suites each week, resulting in quality improvements and higher defect detection rates. (This organization has 20 test coordinators and over 300 testers overall.)

The overall advice from this organization for other companies looking to move to an automated quality approach is to have a clear strategy for how they plan to use an automation tool and establish that plan well before evaluating platforms. Also, companies should understand how subject matter experts will use the automation software because, all too frequently, people buy tools, and then they are simply not used or require the help of outside experts to use. The largest benefits will result when companies leverage automated tools to coordinate well between business and development to improve quality execution.

## Company Background: Additional Offerings

Beyond Worksoft Certify and Worksoft Analyze described previously, the company's other offerings and components include:

- **Certify Execution Manager** is an automatic execution system that enables companies to quickly and easily schedule large volumes of Worksoft Certify functional business process tests to run in an unattended mode (primarily for high-volume tests) or when companies want daily business process validation using dozens or hundreds of servers.

- **Certify Data** is a test data management solution designed to automatically identify and extract representative business data so that it can be embedded into Worksoft Certify during test case construction. Over time, Certify Data also helps customers maintain their test data by performing automatic test data refreshes directly from within Worksoft Certify.

- **Certify Impact** is a risk-based testing solution that identifies, recommends, and executes business process tests based on a set of proposed SAP application changes either directly from the transport or through SAP Business Process Change Analyzer (BPCA).

- **Certify Business Process Procedure (BPP)** is a Web-based reporting module that generates detailed reports for testing, IT audit, and compliance. These automatically generated BPPs help keep documentation current and accurate and can be produced in multiple formats so that they are flexible and reusable for applications including training and Solution Manager Blueprint documentation. BPP reports catalog a sequential set of test steps, grouped by test process and application screen. Certify BPP provides dynamic reporting against Worksoft Certify test executions and test results to provide an audit trail of the business process validation activity. Certify BPP also enables Web-based workflow and approval for

Worksoft Certify assets, including test requirements, test processes, and test results. Certify BPP can also help record and preserve test assets and generate documentation to aid in governance and compliance including regulations such as FDA's 21 CFR Part 11 (helping provide a system of record for reporting, auditing, and compliance).

- **Worksoft Performance** for load and performance testing is a combination of Worksoft technology and consulting services that can allow users to validate the behavior, capacity, and user response time of an application under real-world workload scenarios. Determining the behavior of an application under load and using the results to provision system capacity appropriately can be key activities before the application goes live.

- **Integration with ALM platforms** is possible. Worksoft Certify also enables bidirectional integration with a variety of market-leading enterprise test management solutions such as SAP Solution Manager, IBM Rational Quality Manager, and HP Quality Center. Further, Worksoft Certify includes the ability to create SAP Business Process Blueprints and to populate the Business Process Hierarchy in Solution Manager.

Worksoft's overall goal is to enable end-to-end business process quality to help customers succeed in a complex enterprise application landscape. Worksoft solutions support collaboration across disparate business, development, and deployment teams (and partners and third parties, as needed).

## CHALLENGES AND OPPORTUNITIES

While Worksoft's depth in SAP-specific environments provides differentiation, the company is obviously more bounded with regard to broader ASQ capabilities. Partnerships with other vendors are a core focus for Worksoft to broaden its reach. Beyond integration with the largest enterprise ASQ providers' test management solutions, Worksoft has partnerships with Dynatrace's Keynote Mobile Testing (formerly DeviceAnywhere) and Perfecto Mobile to target mobile platforms. (Worksoft is in the process of further evolving its ASQ SaaS/cloud testing solution.)

As with any automated solution, organizations must shift their processes to enable consistent adoption and usage of Worksoft's tools. Cultural and organizational changes are challenging. Organizational strategies, such as establishment of a center of excellence or centralized quality services, can help facilitate usage and improve ROI.

Partnerships with key service providers (e.g., Accenture, IBM, and Cognizant) are a focus for Worksoft with increasing success, with relationships evolving and strengthening moving into 2H16–2017 to support effective transitions to the adoption of automation.

## ESTABLISHING EFFECTIVE BUSINESS PROCESS QUALITY STRATEGIES

As we have laid out in this white paper, through discussion of three case studies, trends, and quality automation, business process quality is a linchpin that can enable enterprise software to drive competitive positioning and adaptability. Too frequently, companies are straitjacketed by poorly coordinated processes that don't map to business needs and that undermine production systems when deployed. IDC recommends establishing effective processes for business process quality, coupled with a COE organizational structure, and evaluating and adopting automation to cut costs, increase efficient use of resources, and speed deployment.

## 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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