

# Enterprise-Class Dedicated Device Fleets Set to Explode, but Operational Challenges Loom

Challenges With Existing Tools and Development Processes Could Hold Back Growth



**Black  
& White**

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## About this paper

A Black & White paper is a study based on primary research survey data that assesses the market dynamics of a key enterprise technology segment through the lens of the “on the ground” experience and opinions of real practitioners — what they are doing, and why they are doing it.

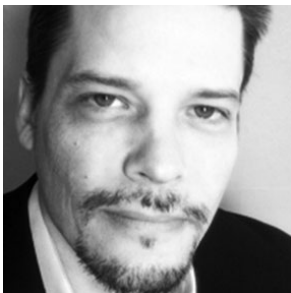
## About the Authors



### **Brian Partridge**

#### **Research Director, Applied Infrastructure & DevOps and Internet of Things**

Brian Partridge is a Research Director for the Applied Infrastructure & DevOps and Internet of Things research channels at 451 Research, a part of S&P Global Market Intelligence. In these roles, Brian has overall responsibility for channel research deliverables and team management. As a researcher he actively contributes to the Internet of Things (IoT), cloud-native technologies, 5G and edge computing research agendas and has subject matter expertise in telecom infrastructure and enterprise networking domains.



### **Jay Lyman**

#### **Senior Research Analyst, DevOps, cloud native, open-source software**

Jay Lyman is a Senior Research Analyst with the Cloud Native and Applied Infrastructure & DevOps Channels at 451 Research, a part of S&P Global Market Intelligence. He covers infrastructure software, primarily hybrid and multi-cloud environments, management and orchestration, and enterprise use cases that center on the confluence of software development and IT operations known as DevOps. Jay’s analysis encompasses evolving IT operations and software release models, as well as the technology used to create, deploy and support infrastructure and applications in today’s enterprise and service-provider markets. This includes running the semi-annual Voice of the Enterprise: DevOps survey of both IT decision-makers and practitioners. Key areas of research also include cloud native, open source software and enterprise end users.

# Preface

Many studies focus on the trends surrounding consumer smart edge devices such as smartphones, tablets and wearable devices, as well as on customer-facing service experiences. There is far less research available on enterprise-class, dedicated device fleets used in the delivery of digital experiences and how DevOps, mobile device management (MDM), testing and OS trends impact deployment patterns.

In a study commissioned by Esper, we set out to better understand how choice of OS and MDM impacts enterprise device fleets, the current mix and trajectory of dedicated device fleets, and the emerging appetite to extend DevOps initiatives into the dedicated device fleet domain. The goal of the study is to answer questions such as:

- How are dedicated device fleets supporting enterprise digital transformation strategies and strategic initiatives?
- Are current MDM offerings meeting enterprise device management needs?
- What operating systems are enterprise developers using, and why?
- To what extent have enterprises embraced, or plan to embrace, an agile/DevOps-centric approach to application lifecycle management?
- Where DevOps toolchains and processes are in place, what have been the results and challenges?

This report presents our key findings and observations, alongside insights into enterprise needs and plans.

## Methodology

The findings presented in this report draw on a US survey fielded in Q1 2022. The survey targeted device fleet stakeholders in companies with more than 500 employees that operate in the retail, healthcare, quick service and full-service restaurant industries (60%), as well as other industries (40%). Survey participants had to be involved in the customization, implementation and embedding of software/operating systems for their company's dedicated device fleets (e.g., tablets, medical devices, kiosks, digital signage, IoT devices), either for internal use or to provide as part of a customer-facing service. This report also draws on contextual knowledge of additional research conducted by 451 Research.

## Key Findings

- **Dedicated device fleets are critical for enabling business strategy.** 37% of all survey respondents 'strongly' agreed that dedicated device fleets are a critical element of strategy, while another 49% moderately agreed. 45% of healthcare and restaurant/QSR respondents strongly agreed.
- **COVID-19 has accelerated investments in dedicated device fleets.** 85% of respondents to our survey said that the COVID-19 pandemic has accelerated the company's investments in dedicated device fleets to enhance the digital experience.
- **Software budgets are projected to grow for dedicated device fleet management.** In the next two years, 58% of organizations expect a moderate budget increase (10-49%), and nearly 10% project a significant increase (over 50%).
- **The size of device fleets will grow substantially in the next three years.** 49% of respondents said they are managing fleets of over 1,000 dedicated devices today, while 69% expect to manage fleets of that size in the next three years.
- **Android is the dominant operating system for dedicated device fleets.** Android OS in aggregate (including AOSP + Android with Google Apps) accounted for 41% of the device estates of those surveyed, alongside Microsoft Windows (26%), Apple iOS (24%) and Linux (8%).
- **There is a high level of interest in Android on x86 devices, but tools to support it are lacking.** 88% of respondents in our survey indicated interest in a solution for Android on x86 devices, but one of the greatest challenges is that there is no built-in MDM support for x86 devices.
- **Commercial off-the-shelf MDM tooling is widely used but failing to deliver.** 84% of survey respondents said that their company currently uses commercial off-the-shelf MDM tools to manage their dedicated device fleets, and nearly three-quarters of them are experiencing challenges with their existing MDM tooling.
- **There is significant appetite to adopt a DevOps approach for developing and managing dedicated device fleet applications.** The percentage of dedicated device apps released in a DevOps manner is expected to nearly double from 35% to 64% over the next three years. DevOps helps close the gap between technical teams and puts focus on targeted business outcomes with success measured by KPIs such as customer satisfaction.

# Introduction

## Dedicated Device Fleets Are Important for Achieving a Digital Business Footing

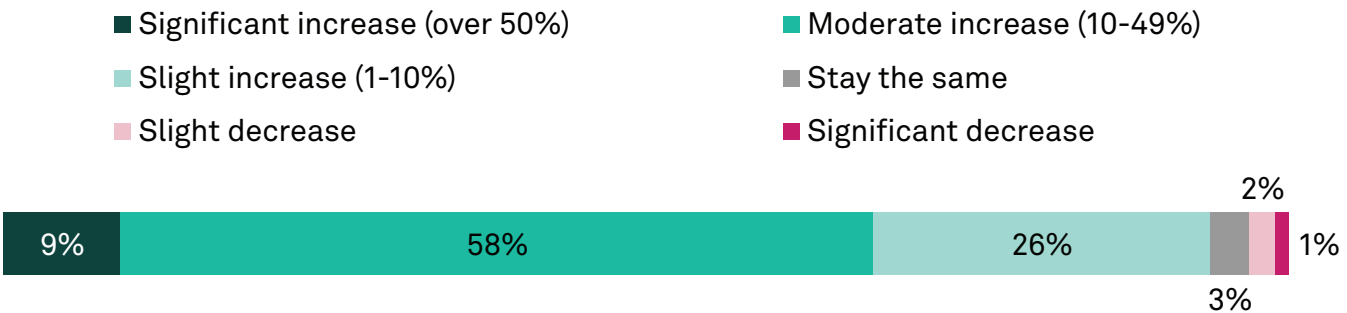
Two years into the coronavirus pandemic, it's clear that COVID-19 has prompted many organizations to accelerate their shift to a more digital footing. In our study into dedicated device fleets, participants said that digital transformation remains top of mind, with 50% of survey respondents indicating their firms are actively executing a formal digital transformation strategy, while the other 50% are planning, researching or, at a minimum, considering such a strategy.

In our survey, 86% of respondents agreed that dedicated device fleets, such as IoT devices that fulfill a single use case, are increasingly viewed as a core element of overall business strategy. Examples of these single-purpose devices include digital signage and handheld devices used by employees for ticket printing or order taking. Furthermore, 89% of respondents agreed that dedicated devices are a critical tool for differentiating services and customer experiences.

Dedicated device fleets can either be employee-facing, such as devices used for inventory management in the logistics industry, or customer-facing IoT devices, such as self-service kiosks, digital signage and medical devices. Given that common use cases for dedicated device fleets include cashier-less checkouts (where buyers scan and go), it is easy to see why 85% of respondents to our survey said the COVID-19 pandemic has accelerated their company's investments in dedicated device fleets. With the need to reduce person-to-person contact, businesses are deploying 'hands-free' options supported by dedicated device fleets to protect employees and customers, especially in typically close-contact spaces like retail stores, healthcare facilities and restaurants.

The projected growth of software budgets is another indicator of the importance of dedicated device fleets to enterprise business strategy. Typical 2021 budgets for this area were \$500,000-5m, and they are expected to grow in the next two years: 58% of organizations are projecting a moderate increase (10-49%), and nearly 10% are expecting a significant increase of more than 50% (see Figure 1). All of this suggests that the drive toward dedicated device fleets is clear-cut.

**Figure 1: Dedicated Device Software Budgets Expected to Grow**



Q: How do you expect your organization's software development spending for dedicated device fleets to change in the next 24 months?

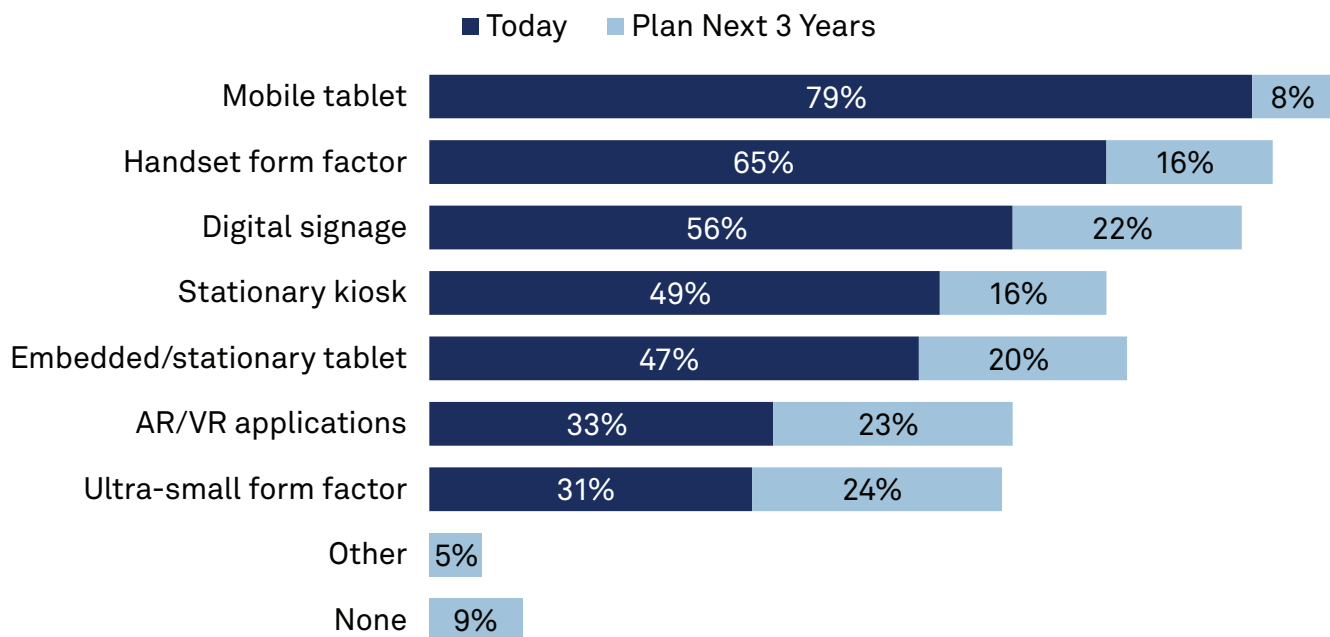
Base: All respondents (n=100)

Source: 451 Research's Dedicated Device Fleet – Custom Survey

# Scale and Composition of Dedicated Device Fleets Are Changing

The deficiencies of existing commercially available MDM platforms are likely to be exacerbated over the next few years. This is because organizations are expecting to increase the size of their device fleets substantially: 49% of respondents reported managing fleets of over 1,000 devices today, while 69% expect to manage fleets of that size in the next three years. Also noteworthy is the expected increase in the number of organizations managing fleets of over 10,000 devices, from 6% of respondents today to 18% in three years. The largest organizations are leading the way when it comes to expanding the number of devices in their estates: 43% of organizations with more than 10,000 employees are expecting to manage over 10,000 devices in three years, compared to 17% of these organizations doing so today. Organizations also expect to expand the variety of devices in their fleets (see Figure 2).

**Figure 2: Dedicated Device Fleet Form Factors Today and Three Years From Now**



Q: Which of the following dedicated device types does your organization deploy today? Choose all that apply.  
 Q: Which of the following dedicated device types, not deployed today, does your organization plan to deploy in the next three years?  
 Base: All respondents (n=100)  
 Source: 451 Research's Dedicated Device Fleet – Custom Survey

Today, the most common device types deployed are mobile tablets (79%), handsets – such as smartphones (65%) and digital signage (56%). Despite relatively high deployment today, digital signage has good growth potential over the next three years. The technology enables quick and inexpensive messaging that can improve both employee-facing and customer-facing communications, rapidly share health and safety notifications, as well as create a more engaging user experience.

The most-cited device types to be added to the roadmap over the next three years are those in the ultra-small form factor (such as nano computers for workers on the move, which will apply to more employees as organizations adopt new models of hybrid home and office working) and AR/VR applications, which organizations are already using for employee training in processes and safety procedures, as well as to enhance shopping experiences and to help workers locate products faster.

# Android Is the Leading Dedicated Device OS

Android is Google's versatile, customizable, open source OS for devices. Unlike competitive systems such as iOS, Android is not optimized for any single manufacturer's hardware. Our study shows that across dedicated device fleets, Android is the dominant operating system, accounting in aggregate for 41% of the estate of those surveyed, alongside Microsoft Windows (26%), Apple iOS (24%) and Linux (8%).

Organizations with a considerable portion of their device fleets (more than 30%) running on Android reported that the primary reasons they use Android are:

- Lower total cost of ownership, which is especially important for retailers (75%) and quick service restaurants (67%)
- Stronger development features and platforms (57%)
- Stronger security features (52%)

Healthcare businesses cited superior integration with the application ecosystem as an important factor in their decision to run on Android (83%).

However, not all organizations predominantly use Android. The main reason given by survey respondents for not standardizing on the Android operating system for smart devices is that their executives prefer Apple iOS or Microsoft Windows. Android still struggles to be perceived as a prestige corporate brand despite innovative designs from manufacturers such as Samsung. Commonly held beliefs about challenges and limitations of Android OS persist, with respondents reporting that the greatest challenges in using Android for dedicated device fleets are:

- Limited application compatibility (40%)
- OS update support lifecycle (38%)
- Security risks (36%)

An interesting contradiction regarding security emerged between respondents working predominantly with Android fleets and those who use a different OS. Android users cited the system's native security features as a primary reason they chose it, while non-Android shops viewed Android as a security risk. This perception of risk is likely due to the commonly held notion that open source software by necessity is open and, therefore, more easily attacked. While that's a natural conclusion to draw, it's worth considering that more people review open source software code, potentially leading to earlier discovery and remedy of vulnerabilities. Nevertheless, the reality is that security risks exist for any device OS, open or closed, and such risks must be actively managed at all times. Despite the aforementioned perceptions of Android OS challenges and limitations, among organizations that are not standardizing on it, more than half are considering using Android in the future.

## The Allure of x86 Hardware

Organizations continue to use x86 hardware as part of their device fleets as it remains a suitable hardware platform for edge devices such as digital signage and kiosks. Because x86-based hardware has been available for a long time, it is well-established and has more software drivers available. This makes for smoother deployments compared to introducing newer chip options where there is more likely to be incompatibility with workplace systems. The current supply constraints facing the global microchip industry have also driven a requirement to sweat capable hardware assets longer, including x86 devices. While we fully expect this challenge will wane over the next 12 months, the situation has amplified the need for contingency planning as it relates to device fleet hardware. Further evidence of the persistence of x86 emerged in our survey: 23% of respondents said that a lack of MDM support for x86 devices is one of the greatest perceived challenges of using Android for dedicated device fleets. Additionally, among respondents who built custom management tools to meet their unique requirements, 29% cited the need to support x86 devices. Given the above, it should come as little surprise that 88% of respondents indicated interest in a solution for supporting Android on x86 devices.



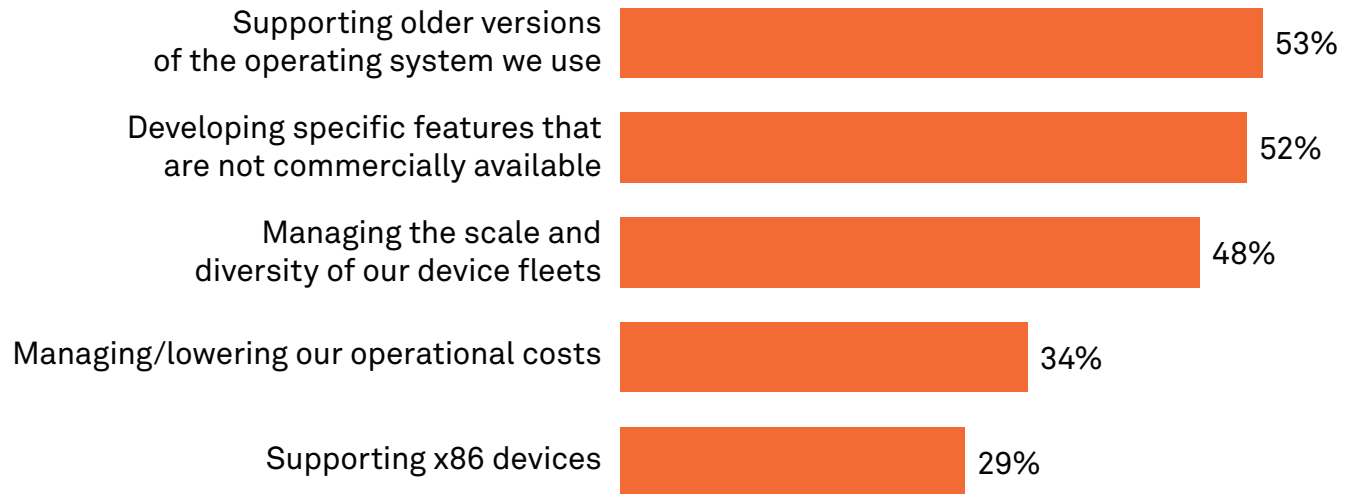
# Dedicated Device Fleet Management

Device management is a necessity for digital transformation, with over 75% of respondents agreeing that dedicated device fleets are a critical element of the company's business strategy. As companies execute plans to become digital-first operations, 84% of survey respondents said that their company currently uses commercial off-the-shelf MDM tools to manage their dedicated device fleets. Unfortunately, nearly 75% of them are experiencing technical challenges with their existing MDM tooling. The top challenges cited include:

- Existing solution is too complex/not easy to use (32%)
- Lack of support for the device hardware they seek to deploy and support – e.g., x86 (31%)
- Poor user interface (31%)
- Irregular cadence of security patches (29%)

Introducing more dedicated devices and IoT endpoints exacerbates security challenges, while ensuring MDM software is compatible with the range of device types and OS versions adds complexity. Most commercially available MDM offerings cannot effectively support the diversity of dedicated devices that make up a fleet. For these reasons, 75% of respondents reported that a lack of commercially available solutions has forced their teams to create custom management tools to meet their unique requirements around their dedicated device fleets. Among survey respondents, the leading reason for designing their own tooling to manage their dedicated device fleet is to support older versions of the operating system in use (see Figure 3).

**Figure 3: Drivers for Developing Custom Device Management Tools**



Q: You indicated that you have designed some of your own tooling to deal with your dedicated device fleet's management needs. Which of the following statements best characterize these needs?

Base: Respondents who design custom tools (n=77)

Source: 451 Research's Dedicated Device Fleet – Custom Survey

Indeed, enterprises using Android operating systems in their device estates are often managing up to 11 or more versions concurrently. Developing specific features that are not commercially available is another key driver for custom in-house tooling, along with managing the scale and diversity of the device fleet. These reasons are indicative of some of the pressing limitations of existing MDM platforms.

# DevOps and Dedicated Device Management

To date in the tech sector, there has been very little discussion about how a DevOps approach to mobile application development and runtime operations might be applied to the deployment of software hosted on devices. DevOps is the secular movement to combine developer and IT operations into a cohesive set of processes, tooling and organizational philosophy, which is often built on a continuous integration/continuous deployment (CI/CD) approach to software development. However, the challenges surrounding device management are quite like those of application delivery, and, consequently, the DevOps processes that make software releases faster, more efficient and more reliable can also improve device management.

For example, the professionals managing dedicated devices are often working in silos: those who configure mobile devices are typically different from those who support mobile devices, and another team is responsible for IT operations. Add into the mix the development of custom applications, and developers are yet another group of stakeholders. If goals and priorities among these teams are not aligned, then device management will not be as efficient and effective as it needs to be.

DevOps is designed to resolve the errors that occur between siloed teams by systematically encouraging cross-discipline collaboration with tools and methodologies and aligning objectives and incentives. This is applicable to fleet device management where coordination and collaboration can provide DevOps benefits such as speed, efficiency and organizational agility.

We have already seen from our survey data that enterprises are managing a variety of hardware devices, as well as varying configurations on each device. And what is more, the complexity and scale of device management is poised to increase as digital transformation strategies proceed. Keeping track of the entities in the device estate, as well as ensuring that software on them is deployed and updated efficiently, parallels the multiple application versions and deployments that DevOps teams manage within their software delivery processes.

Furthermore, since the number of dedicated devices in a fleet is set to reach the thousands or tens of thousands within three years (per 69% of enterprises surveyed), device management teams will need to have an infrastructure in place that begins to compare to large-scale datacenters. As the heterogeneous device fleets scale, so will the mix of applications running on each device. They will increasingly include both custom and commercial off-the-shelf applications and require concurrent support for a myriad of releases and versions. Adding to the already growing complexity is the need to also manage and scale device security and configuration drift. To reduce complexity and adequately maintain the infinite permutations of fleet management considerations, device support platforms need to automate device provisioning, deployment, and monitoring, just as server environments require management automation.

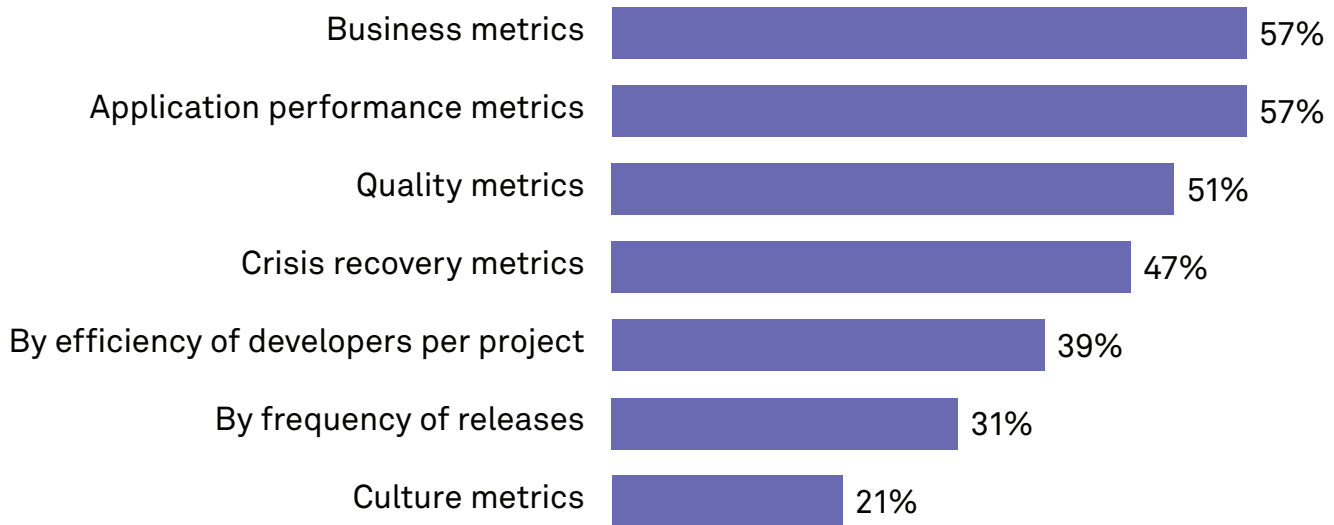
It's important to note that as devices and configurations change, so will device locations and their online/offline status. Device management teams must ensure a seamless end-user experience even though the infrastructure and configurations delivering that experience may change rapidly. The good news is that according to our study, DevOps has been widely embraced for enterprise application development (77%), and there is significant appetite to adopt the DevOps approach for developing and managing dedicated device fleet applications (75%).

## Getting Tools and Organizational Issues Right Ensures a Future-Proof Approach to Managing Dedicated Device Fleets

So how does the DevOps approach help enterprises achieve greater stability and automation within dedicated device fleets at scale? The DevOps approach means that dedicated device fleet managers can provide incremental but continuous updates, rather than attempting ‘one-and-done’ rollouts. It also helps enterprises take a leaf out of DevOps tooling for software-defined infrastructure and employ centralized policies to govern how devices are configured and which software runs on them. Furthermore, DevOps encourages design processes for portability so that device management tooling can work consistently across a range of form factors and performance levels without the MDM software having to be modified.

These are largely technical outcomes, and it’s important to remember that the revolutionary impact of DevOps is its ability to close the gaps between teams to achieve targeted business outcomes. Organizations are also increasingly interested in measuring DevOps success not only by technical metrics, such as quality and application performance, but also by business metrics such as customer satisfaction. Within traditional IT, DevOps has already come to mean much more than speed and efficiency, and among those respondents who indicated they are pursuing DevOps for enterprise application development, this idea was validated (see Figure 4). The leading success measurements are business metrics, including customer satisfaction and user experience, alongside application performance metrics.

**Figure 4: Measuring DevOps Success Led by Business Metrics**



Q: How do you measure and prove the success of DevOps implementations and integrations?

Base: Respondents pursuing DevOps (n=77)

Source: 451 Research’s Dedicated Device Fleet – Custom Survey

Among respondents who indicated they seek to apply a DevOps approach to the development of device applications, the outcomes they hope to achieve include:

- Speeding up time to market (57%)
- Improving quality of user experience (55%)
- Lowering overall costs (51%)
- Organizational agility/flexibility (45%)

Respondents are evidently keen to glean these benefits, as our study reveals that the percentage of dedicated device apps released in a DevOps manner is expected to nearly double from 35% to 64% over the next three years. There is also a desire to deploy apps to production more frequently, with 80% of respondents ideally wanting to deploy apps to production on a weekly or more frequent basis (such as daily or hourly). This is clearly achievable: Among organizations that deploy apps for dedicated devices in a DevOps manner today, 27% release daily, and 40% reported that daily releases would be ideal.

## What Obstacles Stand in the Way of Using a DevOps Approach for Dedicated Device Fleet Apps?

The minority of respondents who do not see DevOps as being right for dedicated device app development have two main reasons for saying so:

- The existing tools available are inadequate to support our specific needs (43%)
- We haven't seen the need to embrace DevOps generally for our purposes (43%)

The second reason was not cited by any large enterprises (those with more than 10,000 employees) in our study, while the first reason was more likely to be cited by organizations that are still considering their digital transformation strategy, as opposed to those already executing or evaluating their strategy.

However, those executing or evaluating their digital transformation strategy are more likely to be facing DevOps challenges in integrating this methodology with their mobile device management approach. One challenge is working with different platforms and toolsets, but equally daunting are the cultural changes required in communication and people management (see Figure 5).

**Figure 5: Getting DevOps and MDM to Work**



Q: What are the biggest challenges of integrating CI/CD and DevOps tools and methodology into MDM at your organization?

Base: Respondents using DevOps for dedicated device fleet apps (n=77)

Source: 451 Research's Dedicated Device Fleet – Custom Survey

# Conclusions

Dedicated device fleets have become an integral tool in enabling digital experiences and supporting business strategy. The global pandemic only accelerated this as digital channels of engagement have become a permanent fixture of customer and employee engagement. We can see from our survey data that enterprises are managing a variety of hardware devices, as well as varying configurations on each device. And what is more, the complexity and scale of device management is poised to increase as digital transformation strategies proceed. This means that the deficiencies of commercially available MDM platforms are likely to be exacerbated over the next few years, especially as dedicated fleets increasingly expand to include Android on x86.

Keeping track of the entities in the device estate and ensuring that the software on them is deployed and updated efficiently closely parallels the multiple application versions and deployments that DevOps teams have to manage within their software delivery processes. Our survey shows that enterprises want to be able to deploy, manage, and update their mobile devices as continuously as they deploy software using DevOps delivery principles. By embracing the concepts at the core of DevOps, supported by the use of a DevOps platform, teams responsible for device management will be able to collaborate more efficiently while handling the large scale of the fleets they oversee.

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## CONTACTS

### **The Americas**

+1 877 863 1306

[market.intelligence@spglobal.com](mailto:market.intelligence@spglobal.com)

### **Europe, Middle East & Africa**

+44 20 7176 1234

[market.intelligence@spglobal.com](mailto:market.intelligence@spglobal.com)

### **Asia-Pacific**

+852 2533 3565

[market.intelligence@spglobal.com](mailto:market.intelligence@spglobal.com)

[www.spglobal.com/marketintelligence](http://www.spglobal.com/marketintelligence)

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