

DEVELOPER ECONOMICS

# STATE OF THE DEVELOPER NATION Q3 2017

The latest trends from a survey  
of 21,200+ developers

<http://vmob.me/DE3Q17>



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## About SlashData™

SlashData™ is the leading analyst company in the developer economy, tracking global software developer trends via the largest, most comprehensive developer research program worldwide. Developer Economics is SlashData's flagship research program reaching more than 30,000 software developers annually in over 150 countries.

Our surveys track the changing landscape of mobile, IoT, desktop, cloud, web, AR, VR, games, machine learning developers and data scientists. We explore trends across all types of developers from students, to hobbyists, to enterprise, as well as developer experiences across platforms, revenues, apps, dev tools, APIs, segments and regions.

Our mantra: We help the world understand developers – and developers understand the world.

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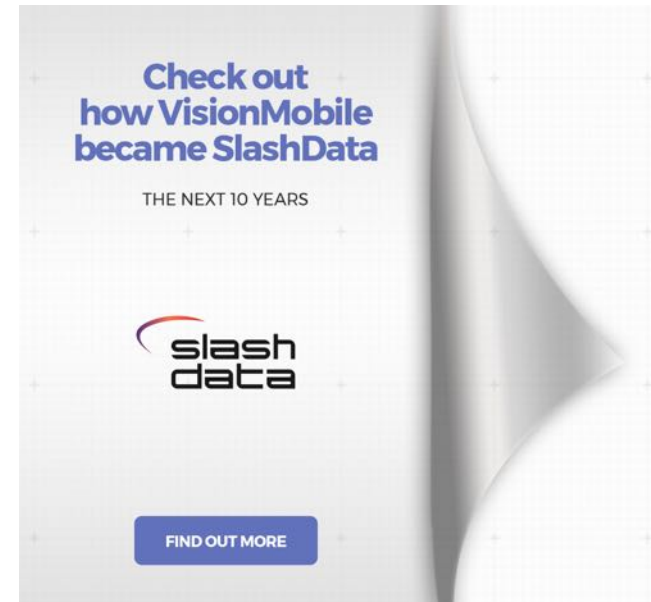
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## From our blog



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## About this report

SlashData Developer Economics is the leading research programme on mobile, desktop, IoT, cloud, web, game, augmented and virtual reality, and machine learning developers as well as data scientists, tracking the developer experience across platforms, revenues, apps, languages, tools, APIs, segments and regions.

The 13th Developer Economics global survey wave ran from April to June 2017 and reached more than 21,200 developers in 157 countries. This research report delves into key developer trends for 2017.

The report focuses on five major themes – each with its own visualisation, showing how the data lends insight into the developer community.

1. Developers have become key stakeholders in recent years when it comes to making technology decisions in companies. Our data show just how far their influence reaches.
2. Game developers are often the first to exploit new technologies; their choices influence which hardware platforms become king of the hill in the future. We take a closer look at where they are placing their bets today.
3. We all know that developers can get quite tribal about the languages and technologies they use. Flame wars galore on the internet. But how much is that reflected in their actual platform choices?
4. Internet of Things technology can add a lot of complexity to what used to be much simpler objects. What makes it so challenging? We look at which parts of IoT are most likely to cause trouble: the hardware, the software, or the data?

5. The world of backend and cloud technology continues to be a fast-moving, ever-changing space. We investigate how the focus of developers shifts between technologies and levels of abstraction.

We hope you'll enjoy this report and find the insights useful! If you have any questions or comments, or are looking for additional data, you can get in touch with Sofia Aliferi, Marketing Manager for SlashData at [sofia@slashdata.co](mailto:sofia@slashdata.co). You can download this free report at [www.DeveloperEconomics.com/go](http://www.DeveloperEconomics.com/go).

Mark, Stijn, Lawrence, Christina, Christos, Matos, Alex, Eitan, Andreas, Emilia, Kosmas, David, Vanessa, Sarah, Andrea, Sofia, Eva, Mostafa, Moschoula, Sam, and Chris at SlashData.

## Thank you

We'd like to thank everyone who helped us reach 21,200+ respondents for our survey, and create this report. Our Research Partners – Intel and Microsoft, our Media Partners, who are too many to name here. Also, a special thanks to Meetups which participated in our survey including:

IoT Meetup Korea, Meet.mobile Wroclaw, Autobot13 Algeria, Artificial Intelligence Hong Kong, API Athens, Amsterdam PHP, Beijing Python, Bucharest JS, Budapest Python, Cocoa Shanghai, DevOps Melbourne, Harbour Front Hong Kong, Hong Kong JS, JS Lovers Meetup, Latvian Developer Network, Munich Frontend, The Web Meetup Australia, and Greece JS.



## PARTNERS

SlashData is very lucky to be supported by the entire developer community: from the largest Internet and software companies to the smallest local Meetups. Partnering with these organisations, big and small, ensures that there is a representative sample across all developers so that something valuable is delivered back to the community. This is a list of the top contributing communities that helped us reach 21,200 responses in the State of the Developer Nation Q3, 2017.

### CHALLENGER / RESEARCH



Amazon Appstore powers game and app publishing for Android and Amazon Fire devices, giving developers instant access to millions of customers across 236 countries and territories worldwide. Committed to keeping publishing easy for Android-based apps and games, the Amazon Appstore offers an array of services making it a complete end-to-end solution for developers from building and testing through marketing and monetization.

[developer.amazon.com](https://developer.amazon.com/)



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## KEY INSIGHTS

- The influence of developers on technology purchasing decisions is abundantly clear. Over 87% of developers with a leadership function no matter how small, as well as two thirds of front-line coders, are somehow involved in purchase decisions. The world of developer tooling has fundamentally shifted: it is no longer the purchasing department that vendors need to woo, but the developer who will use their tools on the floor, and their direct team manager.
- More than a third of developers (incl. 38% of front-line developers) acquire tools for their personal use. This is by itself an important market, but more importantly, it allows developers to act as a ‘wedge point’. They can introduce tools in an organisation for personal use or at small scale, and when proven evangelise the tool across the wider organisation. Targeting individual developers therefore becomes a viable strategy for enterprise sales.
- Game developers are not a small subset of the market. Although only 17% of them consider themselves professionals when it comes to game development, a massive 48% of all the developers we surveyed are building games and the majority of those publish their creations in some form. Their platform preferences are relevant to future platform adoption by users.
- Although there’s undoubtedly still a big difference in the maturity and commercial focus of their efforts, as many game developers are targeting Virtual Reality headsets as consoles (14% each). This is also true amongst professional game developers (25% versus 23%). There are as many developers targeting Facebook’s Oculus as the Xbox One.
- Across all developers who expressed a preference, Microsoft is preferred to Apple by 58% to 42%. However, in many cases that preference manifests as a tribal membership of the Microsoft or Apple ecosystems. A significant fraction of developers within the Microsoft ecosystem have been effectively left behind as the primary computing paradigm shifted from desktop to mobile. 52% of professional mobile developers prefer Apple, and a massive 66% of desktop professionals prefer Microsoft.
- Developers that prefer Apple to Microsoft are significantly more likely to prioritise iOS (48% versus a 25% average for mobile professionals), although note that there’s no relative preference between Apple and Google involved here. More concerning is that just 12% of those who prefer Microsoft prioritise iOS, the same percentage that prioritise Windows 8/10.
- 42% of recent IoT projects that developers in our survey have been working on run over schedule or budget, while only a quarter (24%) are delivered ahead of schedule. 8% are even delivered with more than double the expected duration or budget (or perhaps not at all).

- What makes creating a new IoT device hard, is the combination of hardware (with sometimes extreme overruns) and the software (where most of the added value of an IoT solution is implemented). What makes a data mashup hard is not necessarily only the data analysis itself, but having to coordinate complex systems with software and dealing with connectivity, security, and interoperability challenges.
- The percentage of developers adopting public-cloud based computer services has declined, with the sharpest drop happening for virtual machines IaaS. Among cloud developers using any of the cloud services we cover, only 30% use VM IaaS, down from 46% in mid-2016. Yet, this does not indicate that backend developers have switched to containers or functions as service (FaaS). In fact, adoption of these services also dropped since early 2017.
- Data processing services have increased the most in terms of use over the last year and a half, going from 14% in Q3 2016 to 20% in Q1 2017 to 25% in the latest survey. Google has found an advantage with their data processing technologies. With its well-regarded BigQuery, Cloud Dataflow and Cloud Dataproc, it is not surprising that Google Cloud customers are 37% more likely to use data processing services as compared to other backend developers.

# 1 ON THE INFLUENCE OF DEVELOPERS

Today, Peter Levine is an influential venture capitalist; his opinions are closely listened to and he controls large pots of money. But his career didn't start out this way. In the 1980's and 1990's, Levine worked as a software engineer. He describes the extent of his influence on tool purchasing decisions at the time as follows: "When I was a developer, I had no budget and I couldn't buy a pencil, when pencils were popular. I couldn't buy anything. Whatever central IT had ordered, that's what showed up on my desk." Oh, how the times have changed. Developers have become powerful influencers in their own right, and for the tool vendors of this era, they are a crucial target.

Peter Levine himself describes the transition of developers from pretty powerless line employees to kingmakers as follows, based on his experience with tech startups.

*One of the most notable transformations over the past 5 years has been the pauper-to-prince of the developer as a buying center within a company. [...] As software infiltrates every part of our economy, [developers are now] the lead innovators and they're the lead buyers in companies. What we see are many of our startup companies now deliberately selling to developers as the first wedge point into an organisation. [Developers] all very much have opinions and buying potential.*

--Peter Levine on the [a16z podcast](#) (edited for clarity)

As our surveys are designed to reflect the voice of the modern software developer, we thought we'd get some data on how influential they actually are. For this chapter, we only consider professional developers in organisations that buy tools or components (11% of these developers don't). We also exclude lone wolves: developers who work on their own and where a purchase decision is purely personal.

To some extent, the traditional purchasing structure that Levine referred to from his days as a developer is still alive: the higher up in the organisation, the higher the decision power on tool purchasing. We consider 4 organisational roles of developers: front-line coders, team leads, product managers, and technology CxO's. Front-line coders represent 47% of respondents in our survey, the others 36%. An additional 8%

combine multiple roles. For the purpose of this analysis, they behave like a mix of the latter three roles.

The control of company leaders over budgets and decisions is of course completely expected. Even in small organisations, decision power would rest with more senior staff, especially for making final decisions on team-wide tools and for budgeting.

This said, the influence of developers on purchasing decisions is abundantly clear.

Almost all developers with a leadership function no matter how small - between 87% and 96% of them - are somehow involved in purchase decisions. Even among front-line developers, the bottom rung in the developer organisation, this is still 65%. Between half and two thirds of developers are in a position to make recommendations or influence decisions. In particular team leaders (i.e. senior developers) are big influencers (68%).

*39% of developers acquire tools for their personal use.  
They can become a wedge point for enterprise sales.*

More than a third of developers (incl. 38% of front-line developers) acquire tools for their personal use. First, this means they have at least some decision power and at least a small budget to spend. In aggregate, this by itself is an important market. Second, this increases their influence in their organisations and allows them to act as a 'wedge point', as Levine calls it. They can introduce tools in an organisation for personal use or at small scale, and then have a proof point to demonstrate the tool's value to others, based on actual experience and results. As such, they can evangelise tools in larger organisations. Targeting individual developers therefore becomes a viable strategy for enterprise sales.

Up to a third of mid-level developer leaders (team leaders and product managers) hold the pen when writing specs for tools (32% and 31%, respectively), or even get the final word on which tool to adopt (30% and 27%). Again this indicates that catering to the needs of individual developers is becoming crucial. Even when in a majority of cases developers still need management to sign off on purchases, the days are over when an inadequate tool could be pushed from the top down because it appeared interesting to CFO's or top brass.

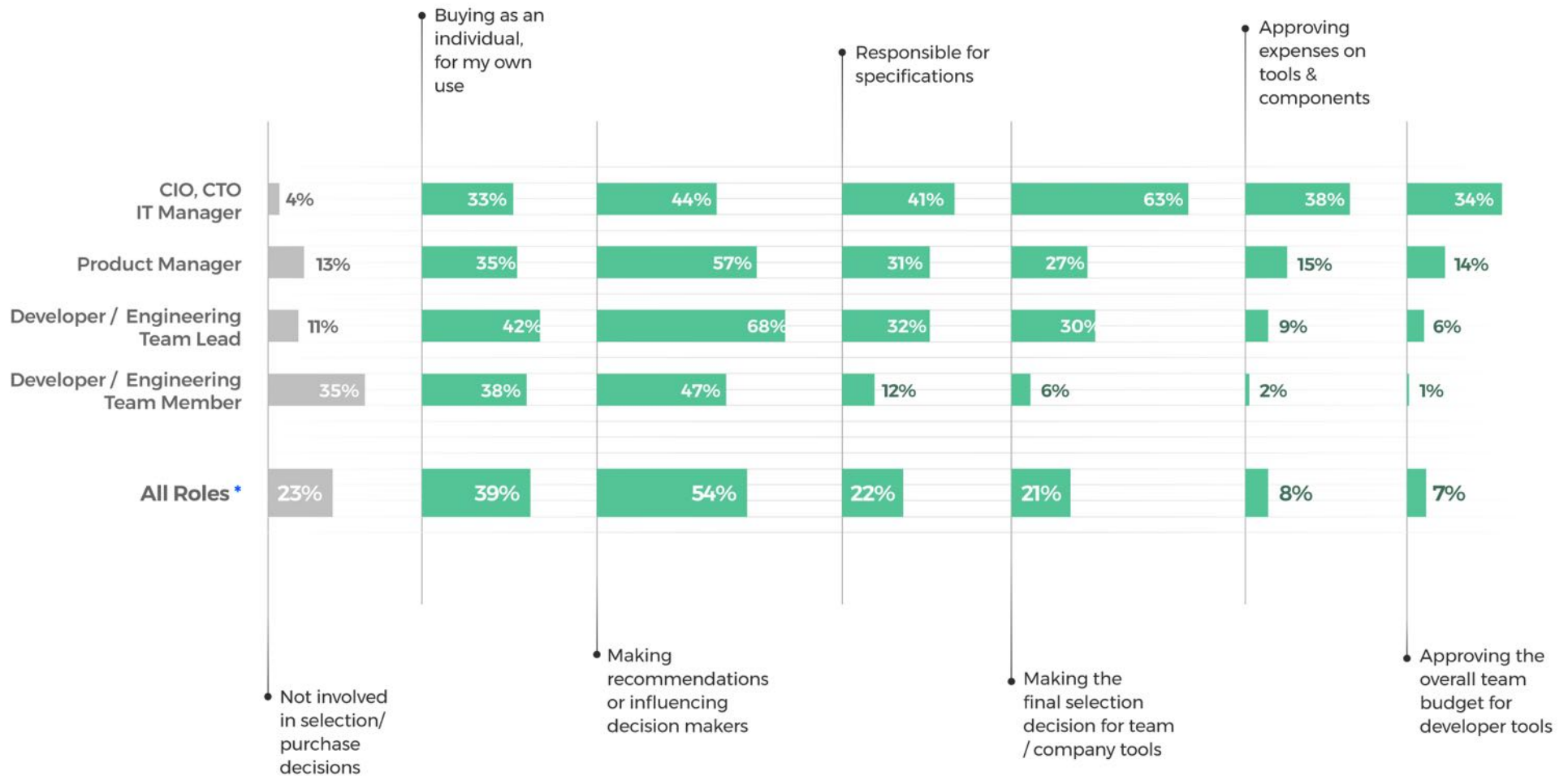
Only for budget and expense approvals, the power still lies elsewhere in the organisation. Even on the CTO/CIO level, only 34% and 38% have budget and expense control, respectively. This makes sense - budgets are never unlimited, and financial decisions rarely belong to function leaders. While this may affect pricing and positioning of developer tools, it will have limited impact on *which* tools (out of a set of competitors) get the most traction. The power for that decision is more and more found at lower organisational levels.

In conclusion, developer experience matters - a lot! From our Developer Program Benchmarking research, we know that developer satisfaction is highly correlated with adoption. The world of developer tooling has indeed fundamentally shifted since the days of Peter Levine's career start as a developer. It is no longer the purchasing department you need to woo, but the developer who will use your tools on the floor, and their direct team manager.

As a research company entirely focused on developers, we will follow this evolution very closely. We'll also gradually be introducing the level of developer influence as a filter in our Dashboard service.

# DEVELOPERS ARE POWERFUL INFLUENCERS – 77% HAVE A SAY IN TOOL SELECTION

% of professional software developers in each role, excluding single-person organisations (n = 11,119)



\* Developer in any of the four listed roles, plus those combining several roles.



## 2 CAN TODAY'S GAME DEVELOPERS REVEAL FUTURE PLATFORM WINNERS?

Video games are sometimes dismissed as frivolous. Serious software runs companies and changes the world. Games are a serious commercial opportunity themselves, earning somewhere near \$100 billion in revenue in 2017. However, perhaps more importantly, game developers are often the first to exploit new technologies. The hardware and software platforms that they decide to support can impact the fortunes of current and future industry giants. By creating compelling new entertainment experiences, game developers entice early adopters to purchase new forms of hardware. This starts the positive feedback cycle of more users bringing more developers, who in turn bring more users. These network effects build an ecosystem around a platform which creates a moat that cannot be crossed with technical capability or cash on the part of rival platforms.

Third-party games were an important part of the value proposition that allowed Apple and Google to rapidly overhaul Nokia and Symbian, and then keep Microsoft (and Intel) largely locked out of the smartphone market. It's likely that hardware platforms which don't support high-quality gaming will not get traction with consumers in the future. This is particularly important for Virtual and Augmented Reality platforms going forwards, although there's another set of platform players here: game engines. The majority of all Augmented and Virtual Reality apps (not just games) are built on 3D game engines. The hardware platforms need the support of these engines, yet that's unlikely without sufficient interest from game developers.

A massive 48% of all the developers we surveyed are building games, and it's a safe bet that a significantly larger percentage

will also choose platforms to use personally that have great games to play. However, the majority of those game-building developers are not very serious about exploiting their creations commercially. Although most of them do publish their creations, just 17% consider themselves professional game developers. Professional developers tend to target more platforms, and types of platform, than their amateur counterparts, but sometimes they also tend to choose different platforms. While smartphones are the most popular platform for all developers (targeted by 64% of all developers and 74% of professionals), professionals target tablets next, while amateurs prefer native desktop games. Given the installed base of smartphones compared to tablets, particularly for Android, it might be surprising quite how popular tablets are. The key is that they run the same software platforms. The most financially



successful mobile games are free-to-play, earning the bulk of their revenue via a tiny percentage of big-spending ‘whales’ – a group of players who disproportionately own and use tablets for gaming, even if the majority of all players are on smartphones. Also notable when looking at the smartphone and tablet platform leaderboards is that iOS is significantly more popular with mobile game developers, particularly professionals (77% for smartphones, 80% for tablets), than the wider mobile developer population (iOS is used by just over half of all mobile developers). This reflects the more affluent iOS customer base with their higher spending on games. We also see support for Windows 8/10 (35% for smartphones and 41% for tablets) well above the level any market share Microsoft has in mobile would justify. This can be attributed to the extensive use of cross-platform game engines, and Windows dominance of the native desktop gaming market.

*A massive 48% of all the developers we surveyed are building games*

The desktop games market itself shows some very strong differences between the preferences of professionals and other game developers. Native desktop and web are the only platform types that professionals aren’t more likely to target than average. These are still important platforms for professionals, the third and fourth most likely to be targeted respectively. The native desktop market is dominated by Windows classic, which has more than twice the level of developers targeting it as Windows modern (UWP). This is an important distinction because the latter are the only games that can be distributed via Microsoft’s Windows Store. Despite the great success of the app store model for game developers on mobile, this market was already largely owned by Steam on the desktop when the Windows Store launched. Games are by far the largest drivers of revenue on the mobile app stores. The lack of revenue and regular visitors looking for new games on Windows Store is a

key component of Microsoft’s struggles, getting their developers (of games and other apps) to care about UWP and adopt the Windows Store for distribution. Professional game developers are more likely to target macOS (47%) than Windows modern (40%), while macOS is a relatively unpopular target for hobby game developers. Aside from the revenue available from affluent Mac owners, this is also related to mobile platforms leading the games market. Professional developers targeting iOS usually need a Mac to build for the platform. If they target both iOS and desktop Windows, then it’s relatively little additional work to target macOS too.

Perhaps the biggest surprise in the data is the relative popularity of Virtual Reality (VR) and console development amongst game developers. Console development on the most popular consoles has always been somewhat restricted, whether it be limited access to development tools, or just limited visibility for independent games with smaller budgets than the triple-A titles that earn the lion’s share of console revenues. However, it’s still somewhat surprising that only 23% of professional game developers are targeting consoles given the large addressable market. Professional developers slightly favour the PlayStation 4 over the Xbox One, but the difference is tiny compared to the roughly 2-to-1 lead in sales that Sony has. It appears that the user bases of both consoles are large enough, and development for the two consoles remains largely cross-platform.

At the same time, although we’ve seen in previous research that games are extremely popular amongst VR developers, that activity has mostly been hobby development. As such it’s quite surprising to see 25% of professional game developers targeting Virtual / Mixed Reality headsets. It’s likely that many of these are not yet releasing commercial VR titles, but the level of activity is well above anything the addressable market would currently justify commercially. It seems that VR has strong appeal for game developers and that makes it very likely that they’ll attract the early adopter game enthusiasts in sufficient numbers to kickstart the hardware adoption cycle. In this market Oculus is leading strongly (60% of all VR game

developers and 71% of professionals), but SteamVR is still in the race (52% of professional VR game developers). Oculus' lead here reflects their first mover advantage, but also the fact that they have both mobile and desktop solutions. Mobile VR is going to be important going forwards, with the next most popular platforms targeted by professionals being Google's Cardboard (50%) and Daydream (34%). Mobile VR is very likely to beat PC-based VR to standalone headsets with large scale commercial adoption. The adoption of Daydream is impressive given it was only announced in October, and standalone headsets were announced while our survey was running. Perhaps an important indicator here is that HTC's Vive running SteamVR was the best tethered VR experience available, but the first HTC Vive standalone headset is running Daydream. However, it's too early to count Intel and Microsoft out in the standalone VR race, and developers are hedging their bets - Windows 10 Mixed Reality has 28% adoption amongst professional VR game developers, while Intel's Project Alloy is only being targeted by 7% of them.

### *25% of professional game developers targeting Virtual / Mixed Reality headsets.*

Perhaps the strongest aspect of Microsoft and Intel's (largely shared) position in VR, is that they see Augmented Reality (AR) and VR as part of a spectrum they call Mixed Reality. They are designing platforms that support everything from a fully virtual world, to an entirely visible real world with some digital augmentation. For game developers a virtual world is much simpler than integrating a game around the environment a player happens to be in. However, with the arrival of standalone VR headsets, player safety starts to require some awareness of constraints (like walls, furniture, and other people) in the outside world. Game developers appear to recognise the common challenges, with a fairly large percentage

of professionals (16%) targeting Augmented / Mixed Reality headsets. In the AR games market the mobile platforms lead, with Android currently the most popular platform, targeted by 72% of all AR game developers and 75% of professionals. Apple's iOS takes second place with professionals (49%), although their announcement of ARKit towards the end of our survey means we'd expect significantly greater adoption there in the near future. iOS 11 will provide a market-leading smartphone AR experience out-of-the-box. To get a similar quality of real-world tracking on Android has required special hardware like Google's Project Tango, which significantly cuts the addressable market and thus developer interest (only 19% of professionals target Tango). Google has responded with ARCore, but tracking quality and adoption remain to be seen. Just outside the top AR platforms is ReticleOS from ODG (12% of all AR game developers and 19% of professionals), who have unveiled perhaps the most compact and stylish standalone consumer AR glasses so far. ReticleOS is also built on Android, which makes it relatively easy for developers to adopt while still reaching the much larger customer base with standard smartphones. However, developers targeting platforms that users already have in their hands is not surprising, this is a new medium and games need players to give developers feedback. Much more impressive is the very significant interest in Microsoft's HoloLens, 48% of all AR game developers target the platform, including 44% of professionals, despite it only being available to developers. Also, Intel's Project Alloy is only targeted by 10% of all AR game developers, but 20% of professionals. The much-hyped Magic Leap, who are yet to launch a consumer product, has attracted less than half as many developer adopters as Microsoft (just 18% of professionals). Their secrecy and NDA-only developer program may backfire unless the platform is a long way ahead of competitors at launch.

Developers are still hedging their bets for the next generation of gaming platforms, and the longer the hardware takes to mature, the more power will accumulate in the hands of cross-platform

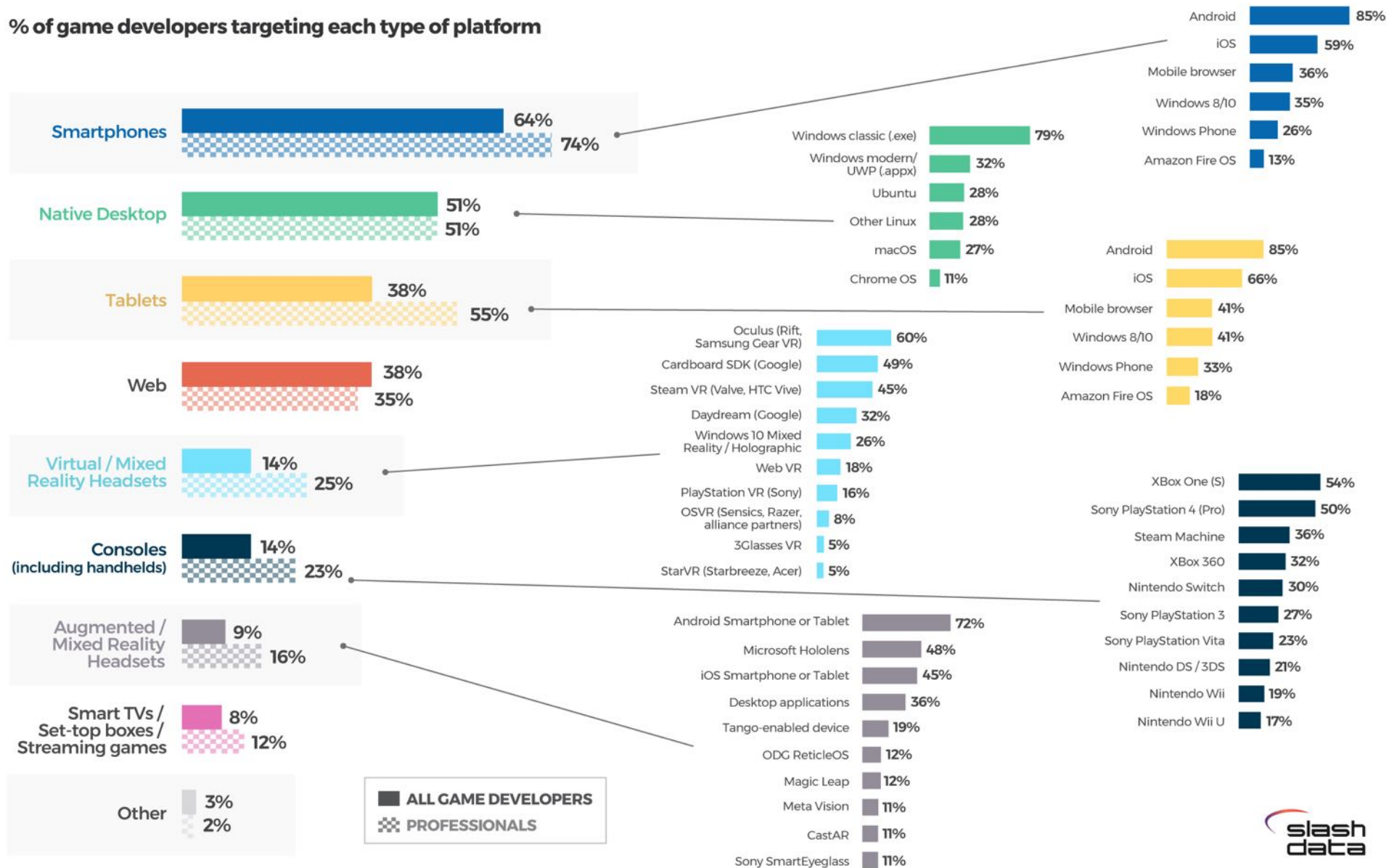
3D game engine vendors like Unity, and Epic Games with their Unreal Engine. Hardware platforms that come late to market will be doomed without support from these market gatekeepers. The game engines may end up with more influence over the industry than the hardware and OS vendors in AR and VR. Knowing which engines developers favour and why could become vital knowledge for platform owners.

However, even with cross-platform 3D engines, any differentiation of platforms at the interface layer still needs to be supported by developers individually, or we end up with a lowest common denominator across platforms. This is where we'll be following the strategies of the various platform vendors with interest over the next few years.

# VIRTUAL REALITY IS ALREADY AS POPULAR AS CONSOLES FOR GAME DEVELOPMENT

% of game developers (n = 3,094)

## % of game developers targeting each type of platform



### 3 THE INFLUENCE AND DANGERS OF TECHNOLOGY TRIBES

Humans are a tribal species by nature. Despite their strong preferences for the logical and rational, developers frequently behave in tribal ways. In most cases the arguments that divide developers into tribes have little influence on the rest of their careers. Whether a developer prefers tabs or spaces (66% choose the former by the way) doesn't have much correlation with important choices like which platforms to develop for, or even what programming language to use. However, when a strong preference for one of the giant corporations that control technology platforms develops, that can have a deeper impact on choices.

Developers tend to work on projects with others on the same platform, and seek information from a wider community doing the same. This creates a natural grouping of people with the same preferences and opinions. This is the kind of 'filter bubble' effect that is polarising political debate around the world, intensifying tribal behaviour. Anyone working in a technology monoculture, using the same platform vendor for everything, should be very wary of this psychological tendency and seek outside influences.

How significant is the impact of these preferences? Our data shows it is linked to the areas of development that are pursued professionally, as well as the platforms and languages selected. Across all developers who expressed a preference, Microsoft is preferred to Apple by 58% to 42%. However, in many cases that preference manifests as a tribal membership of the Microsoft or Apple ecosystems. A significant fraction of developers within the Microsoft ecosystem have been effectively

left behind as the primary computing paradigm shifted from desktop to mobile. 52% of professional mobile developers prefer Apple, and a massive 66% of desktop professionals prefer Microsoft. Similarly, Google is significantly preferred to Amazon overall (75% to 25%), but 32% of professional backend developers prefer Amazon. Of course some may be very rationally sticking with the skills they know, not wanting to climb the learning curve for completely different languages and API sets. Even so, if we look at platform choices it's clear that preferences run deeper than that.

Unfortunately being in favour of one company often ends up meaning being against one or more others, leading to choices that may not make rational sense in markets where the preferred platform vendor doesn't have a strong position. We use mobile platforms as an example here but some similar trends can be found in other areas. Mobile professionals who prefer Apple to Microsoft are much more likely to target iOS



(80%) than those with the opposite preference (only 58%). Those who prefer Microsoft are more than twice as likely to target Windows 8/10 as the Apple fans (34% versus 14%). There's some rational basis for platform exclusivity, particularly with Apple's human-curated App Store, but it makes sense for most apps to target both Android and iOS. Targeting Android is least common amongst those that prefer Apple, 76% do versus 88% who prefer Microsoft.

Probably the strongest evidence of irrational bias is available in the primary platform data. Perhaps unsurprisingly, developers that prefer Apple to Microsoft are significantly more likely to prioritise iOS (48% versus a 25% average for mobile professionals), although note that there's no relative preference between Apple and Google involved here. More concerning is that just 12% of those who prefer Microsoft prioritise iOS, the same percentage that prioritise Windows 8/10. Meanwhile, those who prefer Microsoft to Apple are more likely to choose Android as a primary platform (58%) than even those who prefer Google to Amazon (54%), with both groups being far above average for mobile professionals (45%).

Interestingly, Amazon does not seem to command the same loyalty as these other platform companies, at least in mobile. There's evidence that in some cases preferring Amazon to Google is more about not liking Google than liking Amazon. Those who prefer Amazon are more likely to target (74%) and prioritise (37%) iOS than average, and less likely to prioritise Android (38%). At the same time, they are not significantly more likely to target or prioritise Amazon Fire OS. Indeed developers who prefer Amazon to Google are three times as likely to target Windows 8/10 mobile devices than Amazon Fire OS, despite the relatively good traction Amazon has with Kindle Fire tablet sales and the level of compatibility between Android and Amazon Fire OS.

Of course targeting a platform, or even favouring it as a primary platform, is one thing, while going "all in" and picking a platform's native language as your primary language is another

entirely. Here we see yet more bias. 90% of mobile professionals who consider Swift their primary language prefer Apple to Microsoft (for Objective-C it's 87%). Going the other way, 78% of those who consider C# their primary language prefer Microsoft to Apple. There's probably some dilution due to Unity here, which originated on Apple platforms. Developers who prioritise Java or C/C++ are much closer to the average (47% to 53% in Microsoft's favour). Java developers are also more likely to prefer Google to Amazon (84%) than average amongst mobile professionals, so for most them, Amazon Fire OS is more likely to be an annoying compatibility headache for their Android apps than a preferred platform.

### *66% of developers prefer tabs over spaces*

Microsoft beat Apple in the desktop OS wars. The majority of today's mobile developers were not working in the industry when that happened, yet they've joined tribes that appear to retain a grudge. Perhaps the data reflects a philosophical preference for more open platforms versus more closed and curated ones. Given Google's control over the Android ecosystem and Google Play, and Microsoft's efforts to shift to an app store model, there seems little difference here in practice, certainly not enough to justify the differences in platform preference we see. There's also a warning here for Amazon. Their lead in cloud services with AWS is strong, but they've won relatively little love from developers. If Google can catch up on features and gain credibility with enterprise IT buyers then developers may well be more than happy to switch platforms.

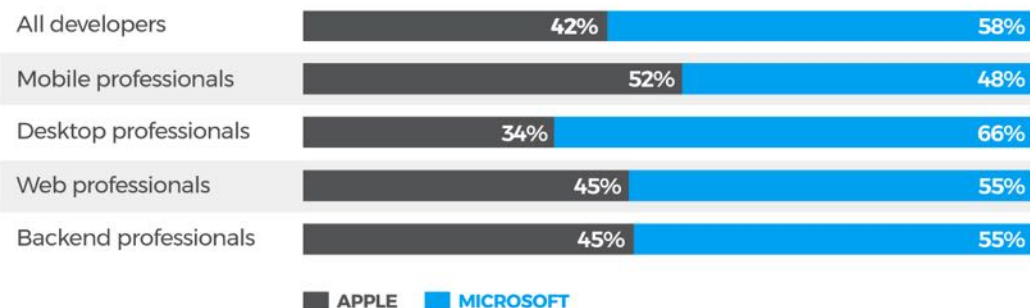
Whatever the future holds for these and future platforms, tribal preferences are likely to play a role. Developers with strong preferences for technologies or vendors could probably all benefit from seeking opinions outside their usual communities.



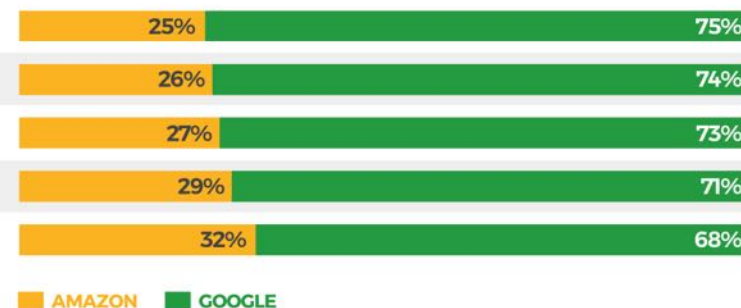
# TECHNOLOGY TRIBES HAVE A MASSIVE INFLUENCE ON PLATFORM SELECTION

% of professional developers (n = 8,617)

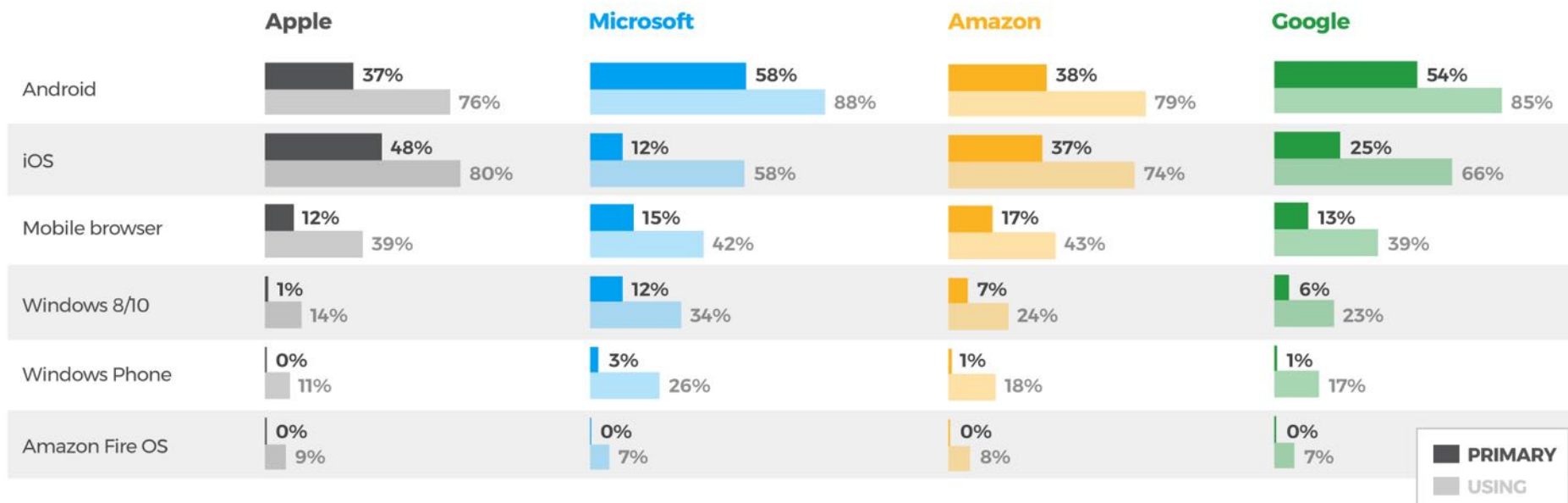
## Which do you prefer, Apple or Microsoft?



## Which do you prefer, Amazon or Google?



## Mobile platforms targeted by professionals based on service preference



## 4 THE INTERNET OF THINGS CHALLENGE

In my first job, I worked for a company developing video security systems. I joined right at the time that the industry was transitioning from traditional cameras based on TV standards to software-driven network cameras. The former were pretty simple to install; it was mainly a matter of providing the right cabling and plugging in the system, similar to how you would plug in a new DVR or Blu Ray player at home. Network cameras were a different matter altogether.

All of a sudden, installers had to expand their skillset from laying cable (mostly a manual-labour task) to configuring routers and troubleshooting network issues. We backend engineers had to deal with a plethora of different APIs and protocols (one for each camera model), security issues, packet-switched, high-volume networking, and of course configuration issues from said inexperienced installers. The possible points of failure in the system multiplied.

This experience taught me a valuable lesson about what we now call Internet of Things technology: it adds a lot of complexity to what used to be much simpler technological alternatives. Even with a simple connected device, the “hardware is hard” adage applies. Security, interoperability, and connectivity issues can and often will cause hard-to-debug problems. When dealing with larger systems with multiple devices, or with data from devices that are out of the developer’s control, the level of complexity only increases.

This complexity is a challenge for any engineer, and our data shows it. 42% of recent IoT projects that developers in our

survey have been working on run over schedule or budget, while only a quarter (24%) are delivered ahead of schedule. 8% are even delivered with more than double the expected duration or budget (or perhaps not at all).

The type of IoT project indeed affects complexity. Developers that primarily work on apps for an IoT device made by another company (e.g. a smartwatch or car app) are about as likely to run over or under schedule. Estimation is still hard - only 37% of projects go as originally planned. On the bright side, the well-defined APIs on which such apps are built can positively surprise developers. 15% of projects come in significantly under budget.

Projects that focus on creating new IoT devices are harder to complete as planned. Almost half of these projects overrun their plan (45%). One in five (19%) sees extreme deviations from the plan, half of those (10%) in the negative sense.

Data mashups that combine data from multiple devices or other data streams are easier to plan and control (only 13% sees very

significant over- or underruns). Unfortunately the outcome is skewed towards overruns: 51% of projects come in over schedule or budget. It might be that in these cases feature creep and shifting specifications play a big role, as do the aforementioned coordination bugs (security, connectivity, interoperability).

When we dig a bit deeper and look at the personal expertise of developers, we see that software, not hardware, is the most challenging bit. Those working on application-level software or data are more likely to have overruns, be it often of a more modest nature than the hardware folks. What makes a new

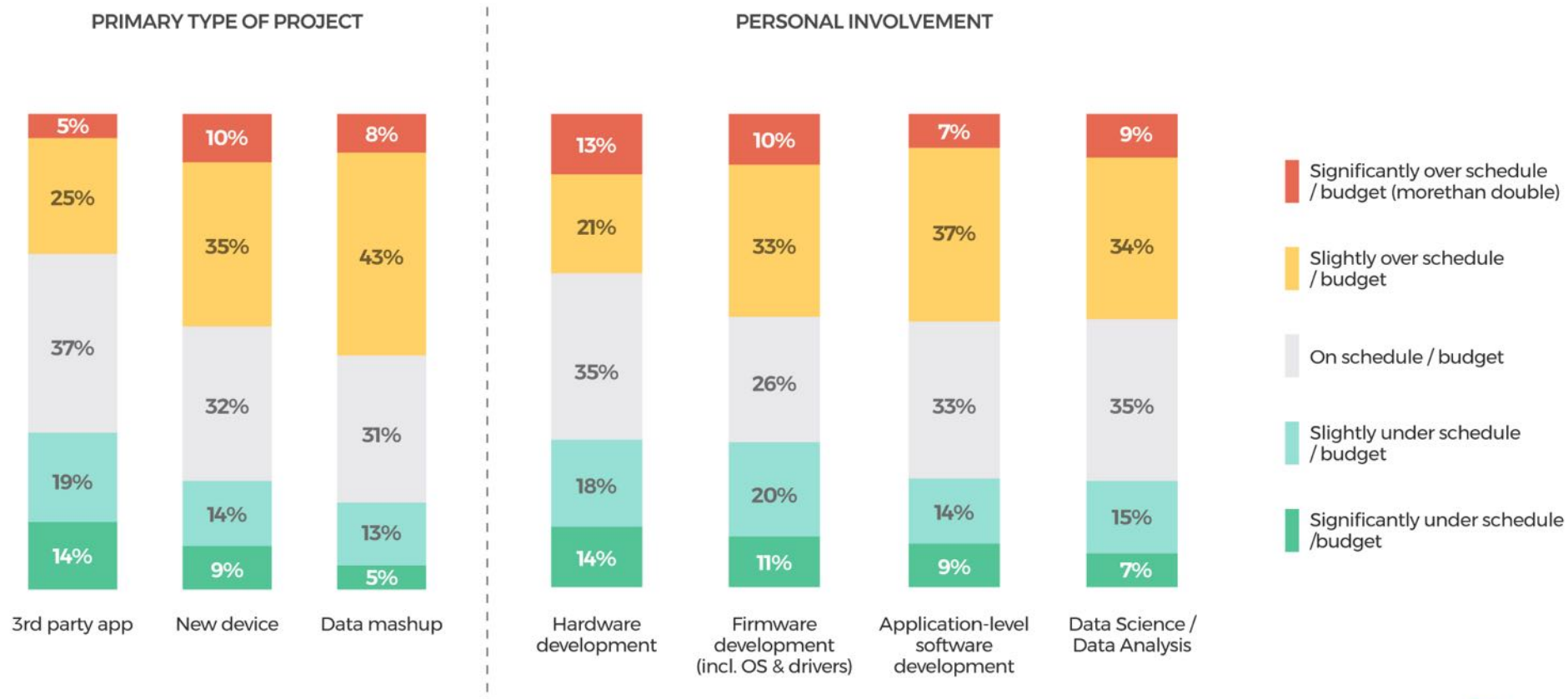
device hard, is the combination of hardware (with sometimes extreme overruns) and the software (where most of the added value of an IoT solution is implemented). What makes a data mashup hard is not necessarily only the data analysis itself, but having to coordinate complex systems with software.

The last word has not been said on the challenges that IoT developers face, of course, and one can get much more specific than the high level correlations we presented here. Any potential difficulties also have to be balanced with the opportunities that are evident in IoT. We are closely following both through our long-standing research in this field.

# 4 OUT OF 10 IOT PROJECTS RUN OVER BUDGET OR SCHEDULE

% of IoT developers (n = 674)

On average across your 3 most recent projects,  
to what extent were your projects delivered on time and on budget?



## 5 BACKEND CLOUD: MORE THAN JUST COMPUTE

Companies continue to migrate workloads to public and hybrid clouds, but that does not mean that individual backend developers are more likely to use a cloud service. To the contrary, the percentage of developers adopting public-cloud based computer services has declined, with the sharpest drop happening for virtual machines IaaS. Among cloud developers using one of the cloud services asked about, only 30% use VM IaaS, down from 46% in mid-2016. Yet, this does not indicate that backend developers have switched to containers or functions as service (FaaS). In fact, adoption of these services also dropped since early 2017.

Paradoxically, the major cloud providers are reporting dramatic revenue increases as enterprises run a greater percentage of their applications in the cloud. As backend developers have gained in-depth experience using VM IaaS from the major cloud providers, they likely realize these services are defined by their ability to dynamically scale as opposed to where the server is located. Cloud providers have traditionally hosted both physical and virtual servers. Just because servers are managed by a third-party does not mean VM IaaS is used. In fact, among backend developers that use a cloud service besides cloud hosting, adoption of server application management and monitoring jumped from 22% in mid-2016 to 32% today. This points to an increased realization that their use of cloud services is often unrelated to available computing power.

Adoption of public compute services may have declined, but more than two-thirds of cloud hosting customers use at least

one of them. Although the majority of this group have only adopted one public compute offering, many backend developers use many of these services simultaneously.

*Data processing services have increased the most in terms of use over the last year and a half, going from 14% in Q3 2016 to 20% in Q1 2017 to 25% in the latest survey.*

Competition between types of compute abstractions remains robust. Cloud platforms are now the most used compute abstraction. Earlier this year cloud platforms (a.k.a., PaaS) reached a short-term peak, with adoption settling at a slightly higher level than seen in 2016 (37% vs. 35%). Cloud platform's

popularity reflects backend developers' desire to reduce the amount of infrastructure they have to manage. These platforms are also chosen because they let you deploy to containers, and functions as well as VMs. In this context, a continuous deployment platform allows people to choose which type of abstraction is most appropriate for specific use cases.

Containers are often deployed via a cloud provider's platform or VMs. Not surprising, use of containers is strongly correlated with the use of cloud platforms, containers and cloud functions. VM IaaS adoption almost doubles to 57% among those that also use container-based IaaS. Whether or not they are deploying to containers within their own VMs or using a CaaS (containers as a service) on top of bare metal is unknown. The likelihood of using cloud functions or serverless among container users double, going from 18% on average to 36%. Container use often identifies someone as being a "cloud native" and willing to be at the leading edge. These developers are more likely to be thinking about their applications from a holistic, DevOps perspective. Consequently, use of cloud monitoring services (e.g. AWS CloudWatch) almost doubles among both container and serverless users.

The definition of backend has evolved. The new cloud native backend developer lives in a "composable" world. They can choose between VMs, containers and functions for compute. Even more importantly, they expect other services to be available *a la carte*. Furthermore, many cloud developers are no longer focused on web sites and ecommerce. Instead, they are also working on mobile and IoT applications that rely on cloud providers for a back end that can dynamically scale based on demand. Two of the most popular backend services are databases and data processing.

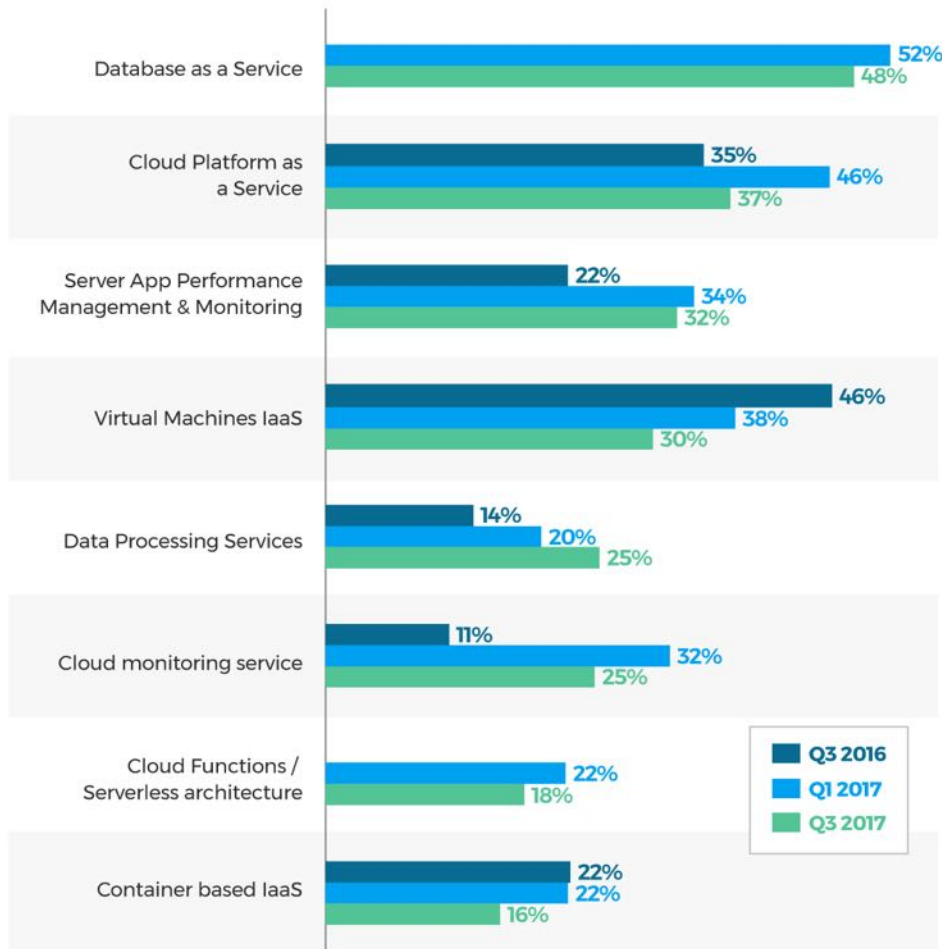
Data processing services have increased the most in terms of use over the last year and a half, going from 14% in Q3 2016 to 20% in Q1 2017 to 25% in the latest survey. They provide the backend for many of the analytical services that have gained traction as Big Data has moved past just being about Hadoop. Apache Spark and Kafka are just two of many open source technologies that enable data processing services like Google Cloud Dataproc and Amazon Kinesis. These technologies are essential enablers of hot fields such as artificial intelligence, machine learning and data monetization in general.



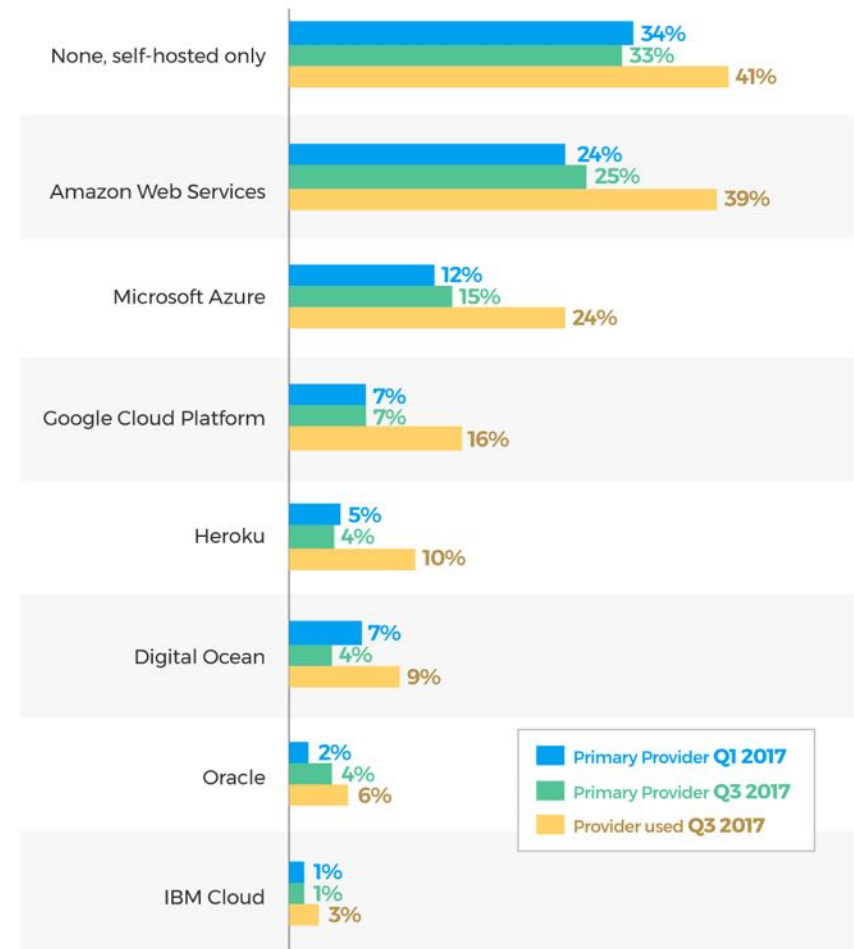
# MICROSOFT AZURE SHOWS STRENGTH DESPITE DECLINES IN OVERALL VM IAAS ADOPTION

% of backend developers (Q3 2016 n=3,933 | Q1 2017 n=5,705 | Q3 2017 n=4,816)

Adoption rates among back-end developers  
using cloud services besides hosting



Cloud hosting providers



Although we did not ask about the vendors used for every cloud service individually, we did ask about companies used for cloud hosting itself. While this is an imperfect measure, it does shed light on how vendor products are moving the market.

It is no surprise that AWS is still the leader with 41% using them for cloud hosting. Microsoft Azure comes in a strong second with 24% using them, with Google Cloud Platform following in third with 16%. Although the percentage of developers using them as a primary provider has dropped slightly, developer-focused Heroku and DigitalOcean came in fourth and fifth place. After it finally released a truly competitive IaaS offering in 2016, Oracle Cloud rose to 6% using them overall.

Microsoft Azure has made gains because it continues to provide leading-edge offerings that fit large enterprise requirements. Companies with more than 10,000 employees are more likely to use Azure and 32% more likely to use VM IaaS. With Microsoft Azure's ability to run VM IaaS in a private cloud, the company appears to be offering a flavor of IaaS its customers will like.

AWS Lambda basically created the market for cloud functions. Recent product releases give Microsoft (Azure Functions), Google (Cloud Functions), and IBM (OpenWhisk) FaaS offerings to compete with AWS. Actually having a product in the category is one reason hosting customers of these four companies are significantly more likely to say they are using FaaS. Although some backend developers may define serverless as event-driven architecture, our survey participants say they are actually using FaaS.

While AWS may have had an early lead with Lambda, Google has found an advantage with their data processing technologies. With its well-regarded BigQuery, Cloud Dataflow and Cloud Dataproc, it is not surprising that Google Cloud customers are 37% more likely to use data processing services as compared to other backend developers. IBM customers have an even higher propensity to use these Watson-type services through Bluemix's dashboard. Yet, although IBM Watson has benefitted from good marketing that has not resulted in significant new adoption of its overall cloud service.

# Exclusive benefits for members of our panel

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slash  
data



## METHODOLOGY

Developer Economics 13th edition reached an impressive 21,200+ respondents from 157 countries around the world. As such, the Developer Economics series continues to be the most global independent research on mobile, desktop, IoT, cloud, web, game, AR/VR, machine learning developers and data scientists combined ever conducted. The report is based on a large-scale online developer survey designed, produced and carried out by SlashData over a period of nine weeks between April and June 2017.

Respondents to the online survey came from 157 countries, including major app, machine learning and IoT development hotspots such as the US, China, India, Israel, UK and Russia and stretching all the way to Kenya, Brazil and Jordan. The geographic reach of this survey is truly reflective of the global scale of the developer economy. The online survey was translated into seven languages in addition to English (simplified Chinese, Japanese, Korean, Portuguese, Russian, Spanish, and Vietnamese) and promoted by 82 leading community and media partners within the software development industry.

To eliminate the effect of regional sampling biases, we weighted the regional distribution across eight regions by a factor that was determined by the regional distribution and growth trends identified in our Developer Economy research. Each of the separate branches: mobile, desktop, IoT, cloud, web, games, augmented and virtual reality, data science and machine learning were weighted independently and then combined.

To minimise other important sampling biases across our outreach channels, we weighted the responses to derive a representative distribution for platforms, segments and types of IoT project. Using ensemble modeling methods, we derived a weighted distribution based on data from independent, representative channels, excluding the channels of our research partners to eliminate sampling bias due to respondents recruited via these channels. Again, this was performed separately for each of mobile, IoT, desktop, cloud, web, games, augmented and virtual reality, data science and machine learning.

For more information on our methodology please visit <https://www.slashdata.co/methodology>.

distilling market noise into market sense

