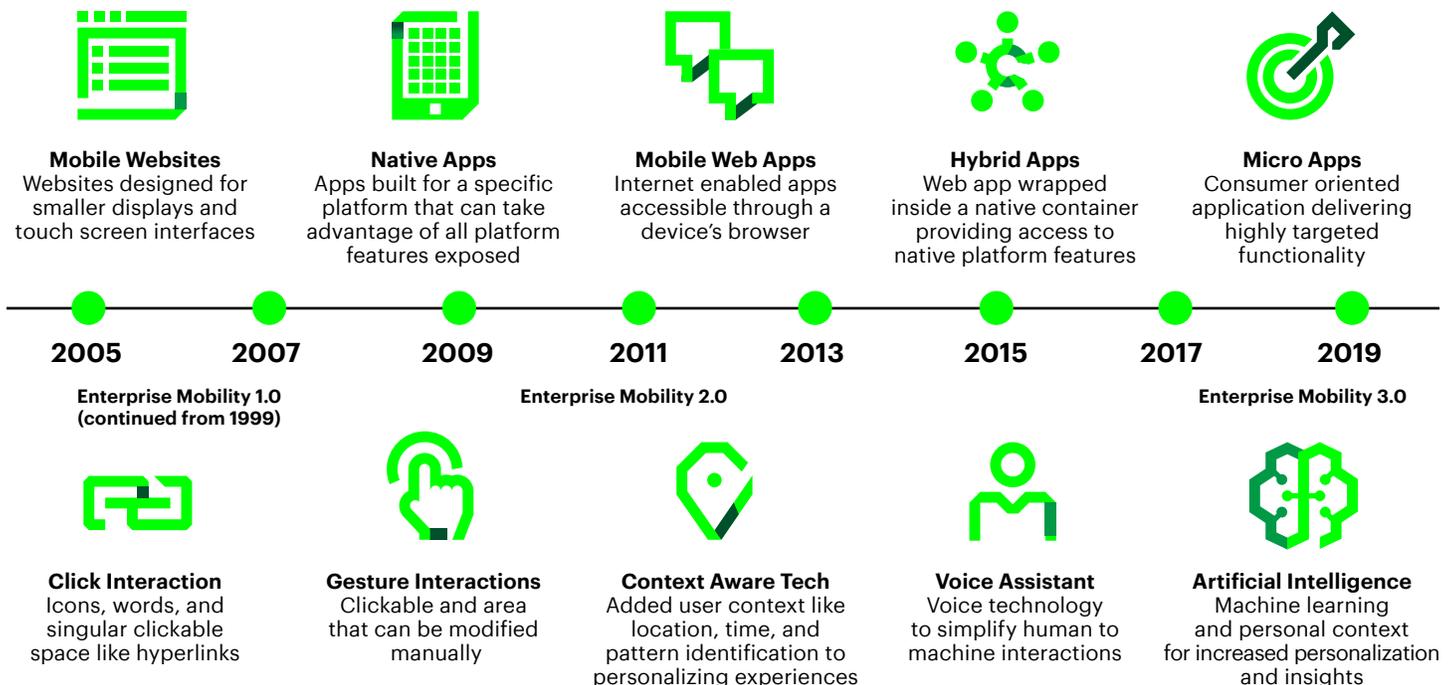accenture

(M)APPING THE FUTURE

Apps have always been at the heart of the smartphone's success. And the kinds of apps we use are changing. New hardware capabilities and the falling costs of supporting ever-more process-intensive and memory-hogging services are one factor. But new technologies using artificial intelligence, for example, and backend platforms using microservices are also big elements of the change. Development is no longer just about native vs. hybrid. Instead there is a myriad of considerations including timing, cost and requirements. Speed is becoming critical as the time required to plan, design, develop and test new apps compresses from months to weeks. The combination of mobile app platform development technology, backend platforms and microservices, along with new hardware capabilities, will continue to push mobile apps' evolution.

MOBILE APPS' EVOLUTION

APP TYPE

Mobile Websites
Websites designed for smaller displays and touch screen interfaces

Native Apps
Apps built for a specific platform that can take advantage of all platform features exposed

Mobile Web Apps
Internet enabled apps accessible through a device's browser

Hybrid Apps
Web app wrapped inside a native container providing access to native platform features

Micro Apps
Consumer oriented application delivering highly targeted functionality

2005   **2007**   **2009**   **2011**   **2013**   **2015**   **2017**   **2019**

Enterprise Mobility 1.0 (continued from 1999)   **Enterprise Mobility 2.0**   **Enterprise Mobility 3.0**

Click Interaction
Icons, words, and singular clickable space like hyperlinks

Gesture Interactions
Clickable and area that can be modified manually

Context Aware Tech
Added user context like location, time, and pattern identification to personalizing experiences

Voice Assistant
Voice technology to simplify human to machine interactions

Artificial Intelligence
Machine learning and personal context for increased personalization and insights

USER INTERFACE

Source: Pew Research Center

The majority of mobile apps today are still built natively for iOS or Android, or on a hybrid platform that supports multiple operating systems. But to meet market demand, there's a growing movement to create simpler, faster and lower-cost apps, eg. micro apps. The user interface is also changing. We're seeing the evolution away from complex, multidimensional apps, to single-use and voice-driven apps. Influenced by in-home devices like Alexa or Google Home or on-device AIs like Google Assistant and Siri, more apps will become hands-free and offer control through voice dialogs, even on the move.

IDC[1] predicts that enterprises' adoption of mobile apps will double in the next two years, from an average of eight enterprise applications today. And most of these applications will need to be developed and customized by the enterprise, with additional complexities that may include the use of AI, analytics and backend integration to legacy systems of record. It's not going to be easy

and it will cost more. According to IDC, the majority of enterprises will increase their spending on mobile app development by up to 25 percent.

But many enterprises face challenges in adopting mobile as part of their digital journey:

- Platform challenges – enterprises haven't settled on one mobile OS or hardware platform.
- Development and operating cost – it is expensive to develop apps and support more than one mobile OS.
- Resources and knowledge – many enterprises don't have the mobile development or security expertise that runs across all platforms.
- Usefulness and business case –for some, it's hard to identify and quantify real savings and value, especially for horizontal use.
- Line of business vs. IT – IT still faces challenges to support business needs in a timely manner.

KEY TECHNOLOGIES SUPPORTING THE EVOLUTION OF ENTERPRISE MOBILE APPS

Enterprise expectations continue to increase around mobility. It's a cornerstone for many digital projects including AI, journey to cloud and even analytics and digital marketing. Customers' mobile phones are a key data point for companies to track their interests, location, purchases etc, as well as offer users real-time interactions.

In the enterprise, the mobile is becoming the dominant computing device. Next-generation digital technologies like AI, sensors, machine learning, cognitive-aware and next-generation apps are being supported by the hardware's growing capabilities. Multicore processors,

advanced displays, intelligent sensors and powerful cameras have all become standard on even entry-level (sub US$200) smartphones.

How enterprises build apps is also changing. Native platform development, especially for customers' apps, still dominates, but hybrid and web-based apps for mobile are also gaining ground. As enterprises match their requirements to the best platform for app development, we see three key architectures emerging: Progressive Web apps, micro apps and instant apps, as shown in the table below.

Enterprises have many choices of app architectures

	Native App	Hybrid App	Web App	Progressive Web App (Shell App)	Micro App	Instant App
Description	Apps built for specific operating systems (e.g. iOS)	Apps built using a combination of web and native technology that is distributed via a native app store	Apps built with web technologies such as HTML5 tools	Use latest browser technologies to meld the accessibility of the web with the presence of the mobile app [4]	Intelligent and aware single-purpose apps on top of existing enterprise systems [1,5,7]	Users can launch parts/components of apps without having to download the app [3]
Trend	Dominant for mobile app development (54% of organizations surveyed) [2]		Growth in apps that are planned are mostly web apps [6]	By 2020, PWAs will have replaced 50% of general-purpose, consumer-facing apps [4]	Sapho is a leading micro app platform and now available in MSFT Teams, SAP, Oracle [8,9]	Available on more than 500M devices globally since launching in May 2017
Key Players	Swift					
Advantages	+ Leverage native platform capabilities + Best performance + Highest security + Best UX	+ Lower cost than native + Faster to build + Access to hardware/software capabilities through plug-ins	+ OS agnostic + Lower cost than native	+ Benefits of native (e.g. app icon, push notifications) and hybrid apps + Lower cost than native	+ Quick to download and develop + Focused functionality (instead of bloated app) + Lower cost than native	+ Leverage native capabilities without needing to download an app + Lower cost than native
Drawbacks	- Dev skills required for all platforms - High development costs	- Compatibility challenges with OS updates	- Dependent on internet connection - Not able to leverage all native capabilities	- Currently not supported on Apple iOS devices	- Limited functionality - Limited audience because highly platform specific	- Apps are limited in scope - Available only for Android

1 Enterprise Mobile Applications Survey: Adoption Trends & Highlights, Nov. 2017

These new app architectures increase development speed, reduce costs and even simplify app interfaces. Micro apps, for example, can still offer a great data experience, but reduce complexity for the user. This means an even better mobile experience with easier access to data sources and the ability to create content as a single-purpose app. That could be a company newsfeed, a scheduler, in fact, almost anything. The trend, especially for customized enterprise apps, is for customer-driven, purpose-built apps that can meet a business case. Off-the-shelf apps from big enterprise software vendors are still in use, but can be expensive to support, and customization is still required by enterprise customers with more specialized needs. And companies no longer want to build big, expensive, time-consuming customized versions in the native architecture. So, these new development capabilities are leading towards more intelligent and interactive apps for enterprise use.

NEXT GENERATION APP TECHNOLOGIES ARE TRANSFORMING THE USER EXPERIENCE

In the end, it's all about the user experience. And next generation app technologies continue to create new possibilities, including apps that are:

- **Immersive** – as businesses learn to integrate digital information into the physical environment, immersive apps will be needed to manage this digital information. More brands will be rolling out AR apps in the near future.
- **Voice** – voice commands, speech-to-text and conversations via our smartphones make our lives easier and faster. Speech as a feature of mobile apps enables us to carry out many tasks on the move.
- **Self-learning** – a system learns from experience, makes inferences from disparate signals, and then takes action in response to new or unforeseen events.
- **AI-driven** – smart interactions, recommendations, deep personalization, and strong context awareness are elevating user expectations.

- **Edge** – data collection and analysis is performed on device. Analyzing data as it is generated reduces latency in the decision-making process.
- **Context-aware** – adapt their behaviors to changing environments, and are the most
- sought after applications in the mobile world.
- **IoT** – from smart connected homes to wearables to healthcare.

Simpler apps can still offer rich data services. Capabilities like voice recognition (voice assistants) are allowing new, simpler interfaces that can access more data, more easily, than single-purpose apps. Some companies have included templatized apps as part of their offering. IBM (in a partnership with Apple), Microsoft, Pega, SAP and others include hundreds of these apps in their enterprise software, providing basic structures for developers to customize. The intent was to speed up app development, but in reality, these offer limited capabilities over and above an off-the-shelf app. Enterprises are still focused on more customized apps, using new techniques and architectures to move faster and cost less.

BACKEND APP SERVICES ARE EVOLVING: MOVE FASTER, COST LESS, AND SIMPLIFY INTEGRATION

One of the biggest challenges companies face as they seek to develop apps is access to data. Many older companies across industries like airlines, healthcare, financial services, utilities (and others) have much of their data spread across multiple systems and probably mainframes which are completely incompatible with web access. This restricts the company from accessing data and using it to their advantage. It is almost always an issue when building and testing mobile apps.

There are a number of ways of accessing this data, whether through developing enterprise serial bus, middleware platforms, or just migrating the data to a modern architecture. But these are costly, complex procedures for which it's hard to build a business case. The bottom line is that it will take some time, as companies move forward with their digital transformation, to free up this data, move it to the cloud and allow secure, but easy access.

So, companies developing mobile applications are faced with the challenge: apps continue to grow in feature complexity at the same time as budgets are decreasing. In order to address this complexity there is a need to develop software applications as a suite of independent, deployable, small modular services that meet a business objective. The approach has to evolve from legacy monolithic structures to one that supports microservices.

RECOMMENDATIONS

Enterprise and consumer users increasingly want mobile-optimized apps that are easy to use and available anytime, anywhere. Enterprises need to ensure they're using the most up-to date architecture, and should consider the following 'realities' of developing mobile apps now and in the future.

1. Build liquid applications – monolithic applications are no longer acceptable. Today's agile world demands a 'liquid' architecture that promotes reusability, scalability and maintainability.
2. Use high performance app services – as the number of different APIs grows, a large number of API calls can lengthen the overall response time. Creating a 'containerized business service' to act as a unified mobile API, which returns data from many sources in a single API call, could be a more prudent option.
3. Connect app services – users have also begun to expect an integrated experience when using applications that connect to disparate systems, whether enterprise back-end, IoT systems, or third-party service providers. Meeting these expectations means being able to connect different services from different providers.

4. Be digital ready – enterprises are looking forward to building applications that support multiple mobile channels providing a consistent experience. In order to support this the platform has to "enable" services to be accessible across a variety of channels by choosing the most appropriate one in some contexts and/or across all channels with consistent experience in other contexts.
5. Adopt intelligent business services – the explosion in the number of devices connected to the Internet of Things (IoT), coupled with a need to provide contextual information to consumers, means applications need to be intelligent. "Use" intelligence and insights from AI, machine learning, analytics and big data. Marry these intelligence and insights to the business moment.
6. Orchestration Ready-- to support customer solutions with right data, right time and right place a mobile platform has to support integration of all the tools, enterprise data and other platform services. This requires the ability to add newer data sources easily and "mash up" services exposed by those data sources to address business process requirements through configurable interface.

Digital Strategy Alignment
Look to build mobile apps as part of an overall digital strategy; use design thinking process to go from "Post-its" to prototypes quickly

Modernized
Evaluate new app architectures and interfaces vs. relying on existing platforms

Integrated
Do not create a silo for enterprise apps, create a holistic enterprise apps planning, development and maintenance capability

Integrated
Plan for supporting two main mobile ecosystems (Google and Apple) for customers, but consider hybrid apps or one platform for employee solutions

Customized
For industry-specific apps, look to customized, developed apps (vs. OTS) which can now compete in cost and time, but offer a more secure, richer capability and better user experiences

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