## The State of Mobile App Development





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# INTRODUCTION



The digital age has seen an explosion in the popularity of mobile applications, and for a good reason. Businesses across various sectors, particularly those in the B2C space, recognize that mobile apps are no longer just a nice-to-have but a must-have. As such, companies are investing in them as they would any physical product, intending to stay competitive and on top of the market.

However, with the constant evolution of technology, it can be challenging for product leaders to stay up-to-date with the latest trends and determine which ones are worth investing in. This raises several questions - which technologies are table stakes, which are disruptive, and which are on the brink of becoming obsolete? How should product leaders prioritize these technologies, and how can they ensure adoption is both realistic and profit-conscious? To help guide companies in their mobile app roadmaps and innovation strategies, we have conducted an in-depth exploration of current trends around sentiment, adoption, and usage of prominent and emerging technologies. This whitepaper will not only provide insight into where trends are headed in the next 12 months, it will also offer practical guidance for product and customer experience leaders on how to prioritize and plan adoption in an attainable and profitable way.

Ultimately, this report will help companies assess their readiness for mobile innovation and ensure they are wellpositioned to take advantage of emerging technology trends in mobile applications, creating exciting customer experiences and staying ahead of the curve.

## Executive Summary

Our research findings suggest that mobile apps are prevalent and indispensable for achieving success in business, particularly in the B2C sector, and increasingly in the B2B domain. The use of emerging technologies is closely associated with the competitiveness of a company's products, and our predictions indicate that adopting and preparing for technologies such as AI/ML, AR/VR, cross-platform development, and IoT will enable companies to remain agile as technology becomes increasingly integrated into daily life. In addition to these insights, we have identified other critical factors.

#### Apps are critical to business strategy and success.

Most respondents rated mobile apps as essential to their company's business success. The importance increased for larger companies and those who have had apps longer— underscoring apps' role in business growth and success.

#### Foundational tech leads in general adoption trends.

The top adopted emerging technologies are Cloud Computing, Cross-Platform Development Frameworks, IoT, Artificial Intelligence, and Machine Learning, while the least adopted are AR/VR and Wearables. This indicates respondents prioritize more foundational technologies in their businesses over newer ones that may require physical hardware to operate effectively.

#### **Middle-market respondents showed slightly higher adoption rates of mobile app technologies.** This reflects a sweet spot for implementing emerging

technologies.

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### Wearables and AI/AR were perceived as the most valuable to consumers.

Respondents lean towards customer experienceenhancing technology when asked about the perceived value of mobile app technologies for end consumers.

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#### Improved Performance was among the most frequently highly rated benefits of emerging tech paired with mobile apps.

Overall, the benefits that scored higher on the scale reflect respondents' emphasis on efficiency, security, and scalability.

### Respondents with older mobile apps are more likely to hire outside help for development.

This indicates that as the maturity and product set of the mobile app grows, so does the complexity of continued development.

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## About this Survey

The survey was conducted in early 2023, targeting a sample size of 401 from North America-based companies. We exclusively reached out to companies that have already developed and use mobile applications. Respondents who claimed they did not have a mobile app product were disqualified from the data.

Although statistical analysis was applied to analyze the survey results, it's essential to note that the sample size may not represent the entire population. Therefore, the data insights in this report should be

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### PART 1

## The Technology TODAY

#### **CURRENT STATE**

Before delving into the role of emerging technology in businesses today, we will explore survey trends around the average company's relationship with their mobile applications. The results showed that most survey respondents consider their mobile app a critical component of their overall business strategy (Figure 1).

This implies that businesses have come to recognize the importance of mobile applications in enhancing customer engagement, driving sales, and fostering brand loyalty. It also highlights the need for businesses to develop a comprehensive mobile strategy that aligns

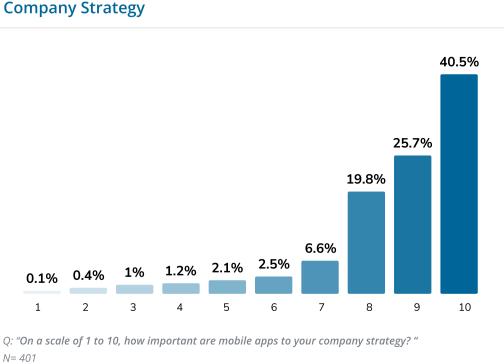
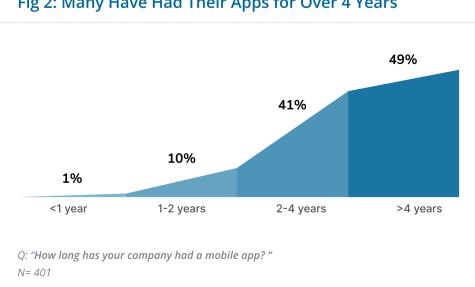


Fig 1: Apps Are Critically Important to Most Respondents' Company Strategy According to the survey results, the importance of mobile apps in a company's strategy increased with the company's size, highlighting its role as a critical business tool for growth. There were also significant differences by industry. Respondents in the Consumer Retail, Financial Services, and SaaS industries were slightly more likely than those in the Manufacturing and Healthcare sectors to rate mobile apps as highly critical.

This could imply that companies with a higher level of technological sophistication and a greater emphasis on customer engagement regard mobile apps as critical to their success. On the other hand, industries that prioritize data privacy, such as healthcare, may place less emphasis on mobile apps.

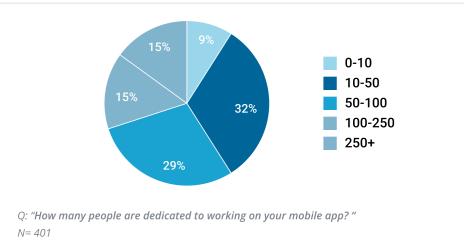
Additionally, the importance of mobile apps appeared to grow over time, with nearly half of the respondents reporting having their app for more than four years (Figure 2). This trend suggests that mobile apps play an important role in a company's success and become more important as the company matures.

Regarding team size, most respondents reported having between 10 and 100 individuals dedicated to their mobile apps (Figure 3). As expected, the number of team members dedicated to mobile apps increased with company size, and companies that rated their mobile app as highly critical also tended to have larger app development teams.



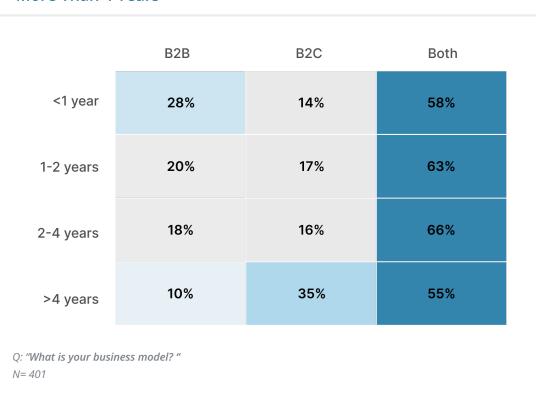
#### Fig 2: Many Have Had Their Apps for Over 4 Years

#### Fig 3: Most Respondents Have Between 10 and 100 People **Dedicated to Their Mobile App**



We explored the role of business models in the use and perception of mobile apps. Out of our sample, 16% of respondents reported having a B2B model, 30% had a B2C model, and the rest had both. Interestingly, we discovered that organizations with B2C models typically had their mobile apps for a longer period, likely due to consumer usage and expectations driving mobile app development faster than business customers (Figure 4).

This suggests that B2C companies may be more attuned to the importance of mobile apps for their business success and have invested more in them over time.



#### Fig 4: B2C Companies are More Likely to Have Had a Mobile App for More Than 4 Years

## Technology Definitions

To help business owners develop their mobile app strategies, we first prioritized a set of technologies to analyze. We focused on these technologies.

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### **Cloud Computing**

Cloud computing is the modern method of managing information technology and digital products. It provides numerous advantages to businesses and individuals, including scalability, flexibility, and security. One could argue that this technology has already emerged, but we have included it as a foundational "emerging" trend in this study.

While most businesses and individuals use the cloud, some companies still manage most of their IT on-premise. However, it is impossible to fully support a mobile app product without cloud computing. Of course, there are challenges with using cloud computing in general and with mobile applications in particular, such as data security and integration, but addressing these issues is worth the effort required to build a strong mobile application. Leveraging cloud computing and all of its benefits in a mobile app demonstrates a company's product strategy's savvy and intent.

Cloud computing is used in mobile applications for cloud-based storage and synchronization. Cloud-based storage, for example, enables users to access their data from any device with an internet connection while also providing backup and data recovery options. It can be used to enable features such as "offline mode" followed by automatic syncing. Another important aspect of cloud computing is analytics. **Data from mobile applications can be collected and analyzed using cloud-based analytics tools, allowing developers to gain insights into user behavior and improve app performance. Data from analytics can also be used to personalize user experiences and increase app engagement.** 

Overall, integrating cloud computing with mobile applications provides a plethora of novel possibilities for improving app performance, user experience, and costeffectiveness. It is also required for the proper implementation of the majority of the other emerging technologies discussed in this report.

## **Artificial Intelligence And Machine Learning**

Artificial Intelligence (AI) and Machine Learning (ML) are computer technologies that enable machines to function or "think" like humans, perform tasks without human intervention, and improve performance over time. Al and machine learning algorithms are integrated with cloud computing services to make mobile applications more intelligent and user-friendly. AI and ML, like cloud computing, are foundational technologies for most companies with dedicated digital products.

Al is required to develop an intuitive application because it involves using algorithms anvd data to make predictions, recognize patterns, and solve problems. Furthermore, without the ability to learn from customer data and activity, such as predictive analytics, a mobile app is significantly less effective and customers notice.

There are several advanced ways to use AI and ML in mobile applications to improve the user experience and the product's ability to be consistently improved. Companies can use AI, for example, to enable mobile apps to understand and process human language, resulting in chatbots, voice assistants, and language translation. AI and machine learning can also enable mobile apps to recognize and process visual data, such as images and videos, as well as create augmented reality.

Some capabilities, such as FinTech, are even more valuable to specific industries. AI/ML, for example, can detect and prevent fraud in mobile payment systems and other financial transactions. AI/ML can be used to monitor health data and provide personalized health recommendations to users in health and wellness apps and wearables. AI/ML is also useful for sentiment analysis, as the app can analyze user feedback and reviews to improve customer satisfaction.

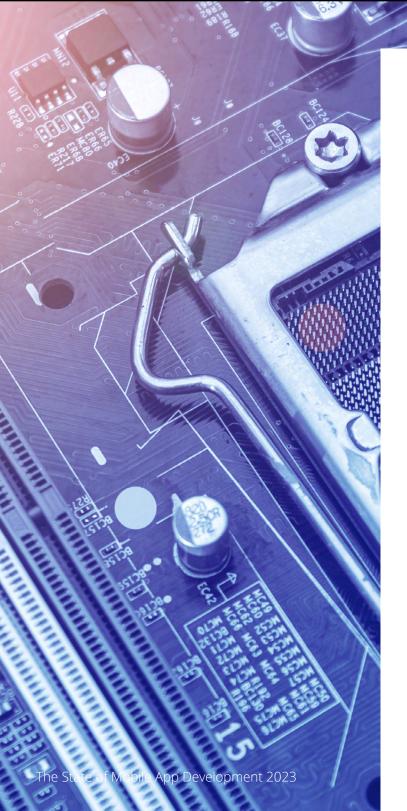


### Augmented Reality (AR) And Virtual Reality (VR)

Augmented Reality (AR) and Virtual Reality (VR) are two distinct technologies that work together to create immersive user experiences. AR is the process of overlaying computer-generated images or information onto the real-world environment, whereas VR is the process of creating a completely computergenerated environment in which people can interact.

AR is evident in some of today's most popular apps, including Snapchat filters, Pokemon Go, and IKEA's AR app, which allows users to visualize furniture in their homes. The AR use case for mobile applications is more obvious than the VR use case. AR is accessed via the camera on a mobile device, with computer-generated images superimposed on the live camera view. VR requires a specialized headset and hand controller to fully immerse users in a digital world. However, as VR hardware becomes more widely available, the value of mobile apps will rise.

While both technologies are more easily envisioned in a B2C model, B2B use cases are still numerous and growing. For example, virtual reality (VR) could be used for training simulations, whereas AR apps could be used to provide remote technician assistance.

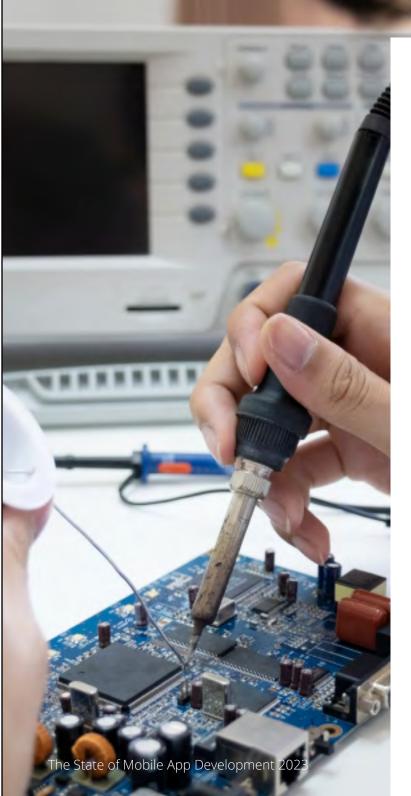


## **Edge Computing**

Edge computing is a game-changing technology that allows data processing and storage to be performed closer to the source, resulting in faster data analysis and processing. This technology is commonly used with sensors and IoT devices to enable real-time data processing that traditional cloud-based remote servers cannot provide.

Edge computing provides significant advantages in terms of speed and efficiency for mobile applications. It, for example, allows users to instantly access their mobile banking accounts via local facial recognition without being hampered by latency issues or security concerns associated with sending data to a cloud server. This reduces processing time, allowing for a faster and more fluid user experience.

Overall, edge computing is an important technology to consider for mobile app developers. It provides a method for improving mobile app performance and user experience by processing data closer to the source, which results in faster and more efficient data processing.



### **Internet of Things**

The Internet of Things (IoT) is an enthralling technology that stands out among the others on this list. It refers to a network of physical devices, such as automobiles and home appliances, that are linked to the digital world in order to provide a seamless and interconnected experience. These IoT devices are "smart," as they are equipped with electronics, software, sensors, and network connectivity, allowing them to collect and process data as well as interact with humans.

Mobile applications can leverage IoT in both B2C and B2B use cases. **Smart home-connected mobile apps, for example, can control and monitor various smart devices remotely, allowing users to adjust the temperature or turn on or off lights from their phones.** Additionally, mobile apps can improve operational and business processes, such as manufacturing, by alerting operators when a machine needs to be adjusted or repaired.

IoT has the potential to transform many aspects of our daily lives, including mobile app development. IoT technology is becoming more common as smart cities, connected homes, and wearable devices become more popular. Developers of mobile apps who fail to incorporate IoT into their strategies may miss out on valuable opportunities to leverage other emerging technologies and truly innovate their mobile products.

### **Cross-Platform Development** Frameworks

Cross-platform development frameworks, rather than simply serving as plug-in tools, offer a comprehensive approach to building mobile applications. They allow developers to create applications that run on multiple platforms, including iOS, Android, and Windows. Because the code can be easily adapted to support new platforms and devices, this approach improves the resilience of applications to technological changes.

Development teams can efficiently build and deploy mobile applications across various platforms by utilizing cross-platform frameworks. This eliminates the need for duplicate efforts and resources, resulting in a more efficient development process. A cross-platform approach to mobile app development allows teams to create more robust, scalable, and flexible applications, resulting in better user experiences and increased user engagement.

### Wearables

Wearables are electronic devices that are worn on the body and can transmit data to a mobile or web-based platform via sensors. Smartwatches and fitness trackers are examples of devices that can track metrics such as steps taken, calories burned, heart rate, and sleep patterns. Wearables can also provide notifications and alerts, such as incoming calls, messages, and reminders, making them a valuable partner for mobile applications.

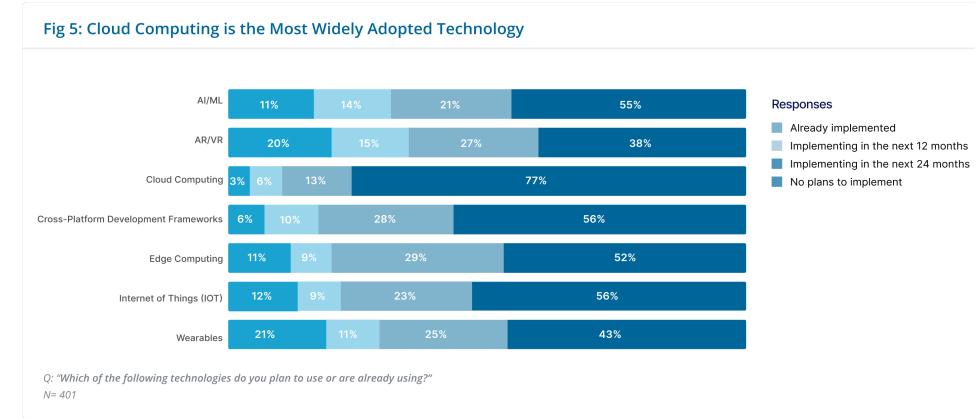
While wearables are more common in certain industries, their applications are expanding as concepts such as IoT become more common. As a result, wearables provide a significant opportunity for developers to create novel applications that provide users with personalized and real-time insights into their health, fitness, and daily activities.

The next few pages explore the market's current technological implications.

## Adoption TODAY

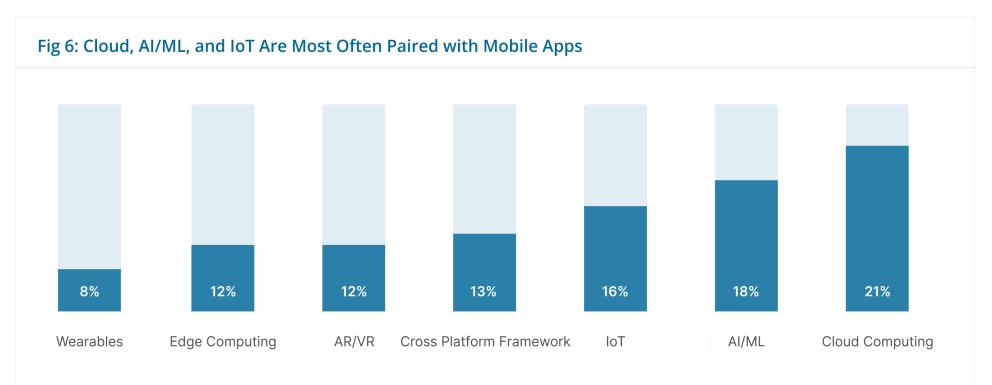
According to **Figure 5**, when asked about their current technology usage, many companies indicated that they use multiple technologies, with cloud computing being the most popular, followed by cross-platform development frameworks. In terms of future plans, Edge Computing was the technology most frequently mentioned as being on the roadmap for implementation within the next 12 months. Respondents were the least likely to have plans to incorporate AR/VR and Wearables into their technology stack. The most widely used items, such as cloud computing and cross-platform development frameworks, are those that aid in overall IT management, efficiency, and scalability.

This indicates that respondents prioritize more foundational technologies in their businesses over newer, less cross-functional technologies and may require physical hardware to operate effectively.



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When we inquired about pairing these technologies with mobile apps, we discovered that adoption trends were similar across the technologies that organizations use in general and those that they pair specifically with their mobile apps--with a few minor differences (refer to Figure 6). Although AI/ML was slightly more likely to be paired with mobile apps, wearables and AR/VR, which also have strong use cases for mobile apps, were the least likely to be adopted. This is most likely because these are among the most recent technologies, and implementing them necessitates specific product sets, use cases, customer willingness, and internal experience.

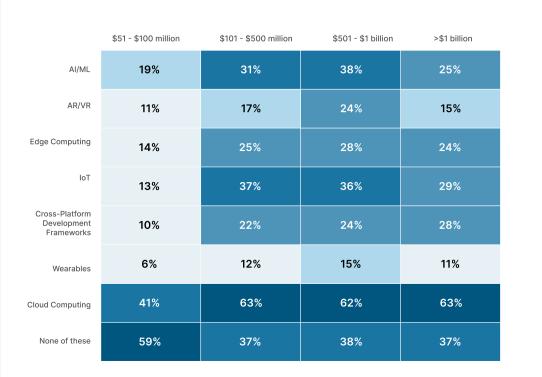


Q: "Which of the following do you pair/incorporate with mobile app development?" N=401

The adoption of emerging technologies with mobile apps varies according to the revenue of the organization. According to our survey results, uppermiddle market organizations were slightly more likely than large organizations and lower-middle market companies to report pairing emerging technologies with their mobile apps (Table 1). This trend could be attributed to the fact that businesses of this size have the resources to invest in technology initiatives while remaining agile enough to implement them effectively. Smaller companies with revenues ranging from **\$51** million to **\$100** million were more likely to say they do not use any of these technologies in their mobile app development.

The following section explores some perceptions and usage trends on the paired technology among respondents with mobile applications. In order to only review respondents with mobile applications technically ready for emerging technology usage1, we filtered out respondents who did not pair cloud computing technology with their mobile app. Cloud computing technology is required to use the emerging technologies covered in this report successfully.

## Table 1: Middle Market Companies are Slightly More Likely toPair Emerging Tech with Mobile Apps



*Q*: "What's your annual revenue?" & "Which of the following do you pair/incorporate with mobile app development?"

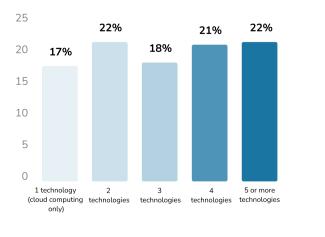
N= 401

## Emerging Tech in Mobile Applications

Regarding the number of technologies that respondents implemented, most respondents paired 1 to 3 technologies with mobile app development. 22% pair five or more **(Figure 7).** 

When examining the technologies that respondents combined, it became clear that the technologies that respondents combined frequently aligned with each other and their potential use cases. AR/VR, for example, is very likely to be appropriately paired with IoT and/or AI/ML, and IoT and Edge Computing are very likely to be paired together. Wearables are the least likely to be paired in general, but when they are, they are most frequently paired with AI/ML and IoT.

#### Fig 7: Most Organizations Pair Several Emerging Technologies with Their Mobile Apps



## Table 2: Emerging Tech Pairings Reflect the Dependencies of the Various Technologies

	AI/ML	AR/VR	Cloud Computing	Edge Computing	ΙοΤ	Cross-Platform Development Frameworks	Wearables
AI/ML	100%	75%	49%	59%	63%	62%	74%
AR/VR	45%	100%	29%	39%	45%	38%	54%
Cloud Computing	100%	100%	100%	100%	100%	100%	100%
Edge Computing	48%	54%	40%	100%	56%	57%	59%
loT	66%	78%	51%	72%	100%	63%	65%
Cross-Platform Development Frameworks	48%	49%	38%	54%	47%	100%	57%
Wearables	29%	36%	19%	28%	25%	29%	100%

Q: "Which of the following do you pair/incorporate with mobile app development?"

N= 238

*Q*: "Which of the following do you pair/incorporate with mobile app development?" *N*= 238 When asked which technologies were the easiest to integrate, wearables came out on top, followed by AR/VR and IoT. Cross-platform Development Frameworks are the most likely to be regarded as difficult **(see Table 3).** Data also indicated that certain business models may have an impact on the ease with which a company integrates. B2C business models report slightly easier integration of technology than B2B, which likely reflects more advanced product and tech teams in B2C companies. According to survey results, all technologies are very valuable to end users, with wearables, AR/VR, and AI/ML leading the pack (**Table 4**). This is most likely due to the fact that these technologies provide users with a personalized and immersive experience, which can lead to increased engagement and loyalty. They can also be competitive offerings; the ability to provide personalized recommendations, chatbots for customer support, and predictive analytics are highly valued by consumers.

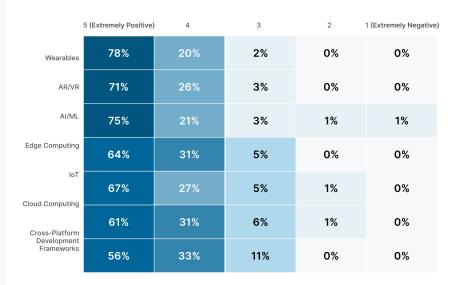
## Table 3: Wearables are Considered the Easiest to Integrate

	Very Easy	Easy	Neutral	Complicated	Very Complicated
Wearables	70%	26%	4%	0%	0%
AR and VR	57%	36%	4%	3%	0%
IoT	42%	44%	11%	3%	0%
Cloud Computing	38%	42%	15%	3%	1%
Edge Computing	38%	40%	15%	7%	0%
AI and ML	38%	39%	16%	5%	2%
Cross-Platform Development Frameworks	36%	37%	20%	8%	0%

Q: "How easy is it to integrate [paired technology] with your existing tech stack in mobile app development?"

N= 238

## Table 4: Wearables and AI/AR were Perceived As the Most Valuable to Consumers



Q: "Do you think [paired technology] would add value to your end consumers?" & "Which of the following do you pair/incorporate with mobile app development?" N=238

**In Table 5,** we also asked about the advantages that respondents derived from mobile applications. Many of the technologies received high marks for "improved performance," as well as for improving security and user experience. Wearables were associated with increased opportunities, and cross-platform development frameworks were seen to aid in implementation, while edge computing was associated with reduced time-to-market. Overall, the benefits that scored higher on the scale reflect respondents' emphasis on efficiency, security, and scalability.

	Technology						
Top Rated Benefits	AI/ML	AR/VR	Cloud Computing	Edge Computing	loT	Cross-Platform Development Frameworks	Wearables
Performance Improvement	~	~	~	~	~		
 Security Enhancement	~		~				
Reliability						~	
Scalability	~		~		~		
 Productivity					~		
 User Experience		~		~			
 Enhanced Productivity							~
 Time-to-Market				~			
 Implementation						~	
Flexibility						~	
Enhanced Monitoring and Tracking		~					~
 Increased Opportunities							~

Q: "Which of the following benefits offered by [paired technology] do you consider most relevant?"

N= 238

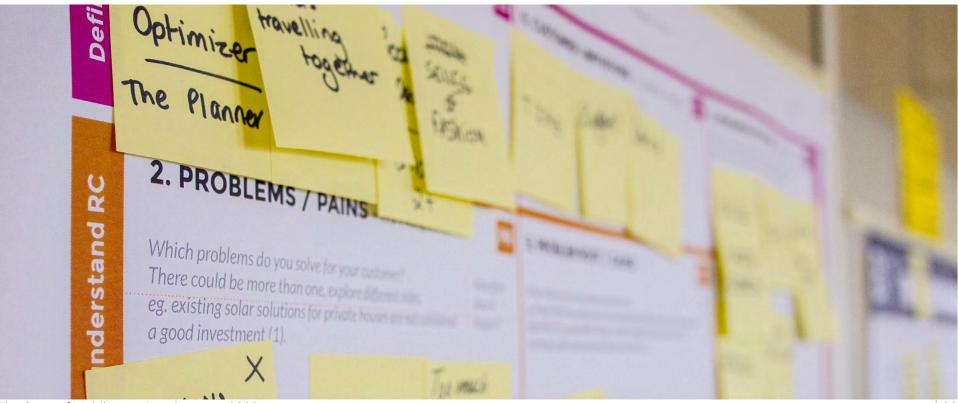
### PART 2

## Building Your Roadmap

While gathering data on emerging trends and their role in mobile applications is important, the real work begins with execution! The following is a step-by-step guide for developing a roadmap for incorporating some of today's emerging technology into your mobile application product.

#### **CONSIDERATIONS FOR YOUR BUSINESS**

When building a mobile application's product roadmap, companies must consider various factors to ensure success. These include their business model, product use case, and tech stack.



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### 1. Business Model

B2C companies often have an advantage in mobile app innovation, but B2B companies are catching up quickly. Mobile applications are making their way into every process, from logistics and shipping management to accounting and procurement software. While some industries may have fewer "plug-in" technologies to start with, consulting services can help B2B companies develop strategic apps. When determining scope, timeline, and budget, keep in mind that B2B companies may require the assistance of third-party services for integration or development.

### 2. Product Use Case

Determining your product's success metrics and revenue targets is critical for prioritizing your roadmap. For example, health and wellness apps may benefit from prioritizing wearable technology, whereas manufacturing and logistics may benefit from AR/VR technology for virtual warehouses. Which technologies will generate the highest ROI and agility for your product?

### 3. Tech Stack and Tech Debt

Before diving into the roadmap, companies should assess the state of their technology stack and any technical debt that needs to be addressed. While developing a mobile app with innovative emerging technology is exciting, connecting it to a larger technology product built on efficient development processes is critical. A current state assessment can help inform decisions about prioritizing and implementing the roadmap.



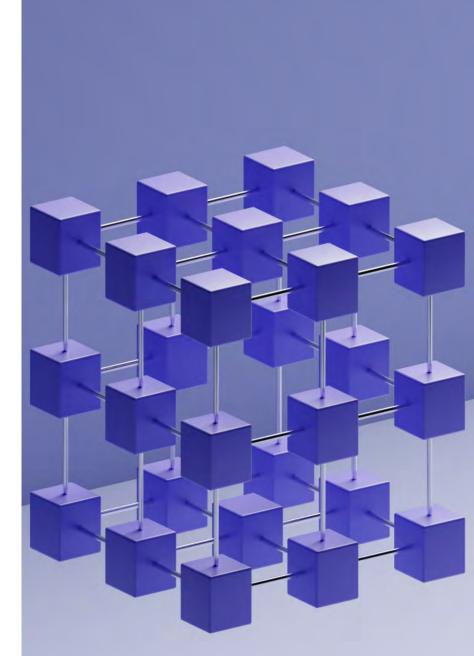
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#### UNDERSTANDING EMERGING TECH RELATIONSHIPS

Few emerging technologies can be implemented as a standalone plug-in by product and technology teams; instead, almost all rely on a solid foundational technology to support them, and many of the technologies mentioned in this report rely heavily on each other. For example, edge computing depends on cloud computing technology and cannot function properly without it.

Another example is the use of AI/ML; in order for businesses to properly use this technology, they must have optimized data from which the AI/ML can glean. Furthermore, if wearables technology is to respond intuitively to user data, it must be built on top of solid AI/ ML technology. Product owners should constantly contact their tech partners at your company to help with this.

In addition, maintain an awareness of the inherent pros and cons of these technologies, and keep in mind that because they are emerging and relatively new, we must learn about them and their risks. For instance, IoT raises security and privacy concerns because the vast amount of data generated by these devices is susceptible to hacking and other malicious actions.



#### THINKING SHORT AND LONG TERM

Consideration of the potential business future is an essential component of product planning and development. While an MVP may be the initial focus, the roadmap for future iterations should reflect the company's long-term goals. This entails comprehending the company's strategic business vision and aligning its product roadmap.

Conversations with the company's business leaders are essential for achieving this alignment. These discussions can shed light on where the company wants to be in the next five years and how a mobile application can help them get there. Product leaders should be aware of the company's strategic direction and work to align their product roadmap with it.

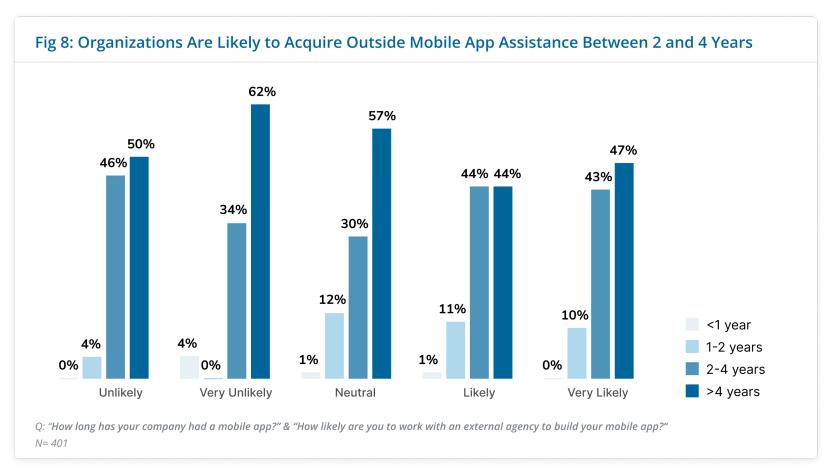
It is important to note that the long-term vision and the technologies included in its current plans may evolve over time. The company's strategic direction may change as it grows, the market changes and technology evolves. Product managers must be aware of these changes and adjust their roadmap accordingly.



#### CONSIDERING OUTSIDE HELP

One of the most important decisions after creating a roadmap is how to carry it out. Some companies prefer to develop their apps in-house, while others seek outside assistance. Some may begin developing their mobile products before considering external assistance, but research shows that as organizations have their apps for a longer period of time, especially between 2 and 4 years, they are more likely to hire an external agency **(Figure 8).** 

Product leaders should not approach agencies hastily, but they should also not dismiss them. It is critical to understand potential partners' offerings, the stages of the mobile app lifecycle and management in which they can assist, and the value they bring. Then, consider how these relate to your product app's goals. For example, you may conclude that some roadmap items can be created inhouse while others require outside assistance. This knowledge will be valuable as you plan and execute.



## Conclusion

Mobile apps are so important to the products and customer engagement of many companies that many product leaders need to leverage the latest emerging technologies in order to stand out. However, it's very important to understand that building from the ground up is the key to making a successful mobile app.

This means putting tools like cloud computing, crossplatform development frameworks, and edge computing at the top of the list and knowing when to move on to more advanced technologies. By doing so, businesses can set themselves up for success and make it possible for bigger goals, like IoT integration, later on. A wellplanned product roadmap looks at both the present and the future. This measured, strategic approach to developing mobile apps can help businesses reach their goals in a market that is very competitive.

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## About MM

Mutual Mobile is a leading digital product development firm that works with Fortune 500s and startup unicorns to bring breakthrough experiences to life. Voted Texas's Top Android and iOS Developer, we've helped brands like AccuWeather, The Economist, Disney, Audi, and Under Armour among others craft mobile experiences that drove revenue, delighted users, and won multiple CES Innovation Awards.





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