ANALYSIS GROUP

The Continued Growth and Resilience of Apple's App Store Ecosystem

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The conclusions and opinions expressed are exclusively those of the authors.

The App Store ecosystem: 2022 at a glance

The App Store ecosystem facilitated a groundbreaking $1.1 trillion in billings and sales worldwide in 2022. More than 90% of this figure originated from transactions that did not happen through the App Store, meaning that these amounts accrued solely to developers and other third parties, and that Apple collected no commission on them.

Over the past few years, through the ebbs and flows of the COVID-19 pandemic, the App Store ecosystem grew at a substantial and remarkably steady rate (between 27% and 29% annually), consistent with a flourishing marketplace. This steady overall growth hides important variations within app categories that reflect consumers' changing habits as the pandemic evolved. For example, some categories grew substantially in 2022 as many people returned to in-person activities, with travel (up 84%) and ride hailing services (up 45%) leading the way. Other categories, such as grocery sales, food delivery, and digital goods and services consumed on iOS apps, grew more modestly in 2022 after booming at the height of the pandemic. In-app advertising on iOS apps grew at a faster pace in 2022 than 2021, driven by the strong performance of social media, podcasts, and general retail apps.

$1.1 trillion
ecosystem in 2022

+29%
growth in the ecosystem in 2022

+84%
in iOS-app-based travel sales in 2022

+45%
in iOS-app-based ride hailing sales in 2022

Variations across regions were also notable, with a number of factors at play in certain regions in a challenging global economic environment: Inflation, a stronger US dollar, and regulatory headwinds in the video game industry in China. These factors should be considered when interpreting our global results and regional variations.

Fifteen years of the App Store

The App Store has been a safe and secure home to a large and varied array of apps for 15 years. Users today have access to over 123 times more apps than they did at the end of 2008, and annual downloads on the App Store increased 15-fold between 2009 and 2022. Users have downloaded apps more than 370 billion times and developers have earned more than $320 billion in earnings directly on the App Store since its launch. Over the past 15 years, the App Store has supported new and growing sectors of the economy and has provided businesses with new ways to engage with customers and lower costs.

Apple has implemented rules and policies, such as the strict App Review process, to foster user trust. These policies have prevented billions of dollars in fraudulent transactions. Apple has also supported developers over the past 15 years through a variety of technical tools, analytics, and education initiatives, all of which have helped developers add new functionality to their apps, track their performance on the App Store, and receive support from Apple experts.

In 2022, over

90%

of billings and sales facilitated by the ecosystem occurred outside the App Store.

The App Store ecosystem

The App Store ecosystem globally in 2022

We estimate that the App Store ecosystem facilitated more than $1.1 trillion in billings and sales worldwide in 2022, up from $868 billion in 2021, $643 billion in 2020, and $519 billion in 2019. Of that total, $104 billion, or 9%, originated from billings and sales of digital goods and services consumed on iOS apps; $910 billion, or 81%, from sales of physical goods and services made on iOS apps; and $109 billion, or 10%, from in-app advertising on iOS devices. (See Table 1.)

Apple only collects a commission on app purchases, in-app purchases, and in-app subscriptions that go through the App Store. No commission is collected on purchases of digital goods and services that happen outside of apps (e.g., purchasing a subscription to a newspaper through a web browser), on purchases of physical goods and services through apps (e.g., when a user pays for a ride on a ride hailing app or buys groceries online), or on in-app ad revenue. More than 90% of the $1.1 trillion in billings and sales facilitated by the ecosystem occurred outside the App Store, meaning that these amounts accrued solely to developers and other third parties and that Apple collected no commission on them. The share of billings and sales that accrue solely to developers has continued to increase year-to-year. (See Appendix Table 1 for further methodological details.)

Billings and Sales

"Billings" refers to app purchases and in-app purchases, including subscriptions, which use Apple's in-app payment. "Sales" refers to money spent by customers purchasing goods and services in general. We use the term "facilitated" to include the various ways in which apps contribute to generating billings and sales.

Table 1: Estimated Billings and Sales Facilitated by the App Store Ecosystem, Worldwide, 2019-2022 ($ Billion)*

	2019	2020	2021	2022
Digital Goods and Services**	**$61**	**$86**	**$102**	**$104**
Physical Goods and Services	**$413**	**$511**	**$678**	**$910**
M-Commerce				
General Retail	$268	$383	$471	$621
Travel	$57	$38	$56	$102
Food Delivery and Pickup	$31	$36	$66	$77
Grocery	$14	$22	$43	$52
Ride Hailing	$40	$26	$33	$48
Digital Payment	$4	$5	$9	$10
In-App Advertising***	**$45**	**$46**	**$88**	**$109**
Total	**$519**	**$643**	**$868**	**$1,123**

* Totals may not sum due to rounding.

** Billings and sales from digital goods and services are not the same as App Store billings. We include sales from digital goods and services purchased elsewhere but used on apps on Apple devices, and we subtract billings from in-app purchases made via the App Store but used elsewhere. The estimate relies on third-party sources and Apple data. See Appendix for details.

*** iOS in-app ad revenue; does not include mobile web, search ads, and Apple Search ads.

Methodology

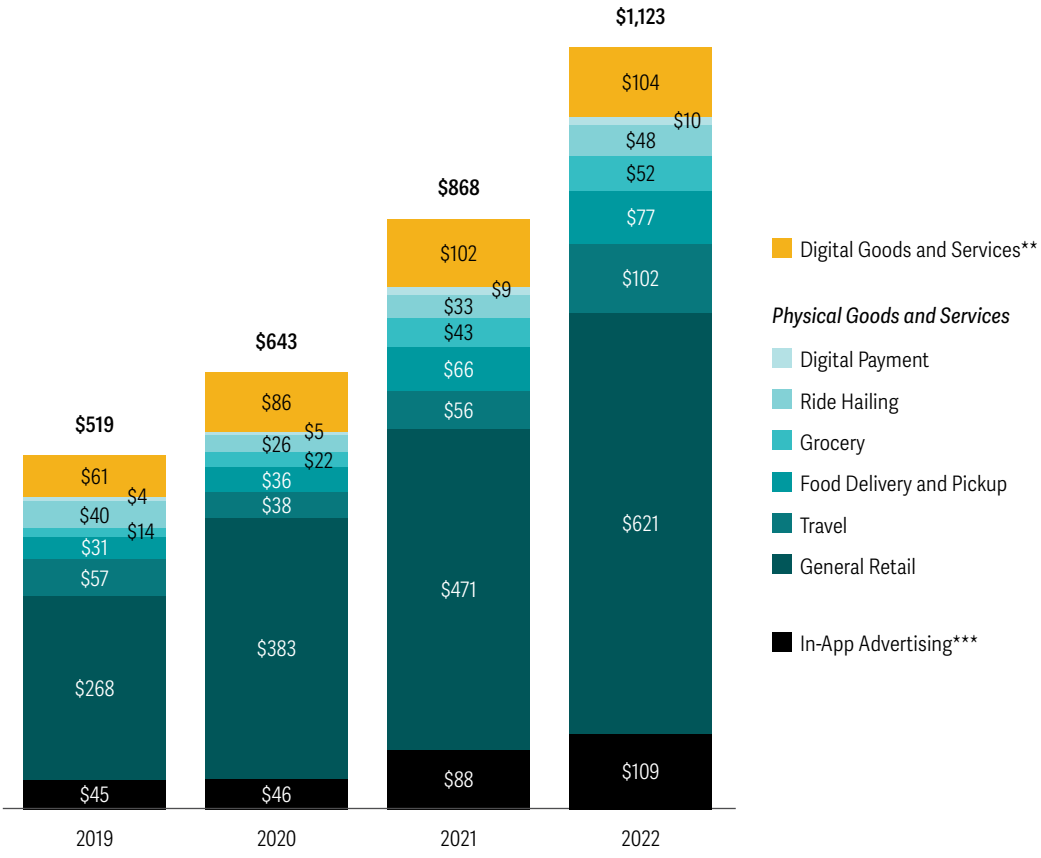
"iOS apps" include apps on iPhone and iPad devices. Apps developed by Apple, such as Apple Music, as well as mobile browser apps, such as Google Chrome, are excluded from this analysis. Third-party apps featured within Apple TV are included in our analysis of video streaming. Categories as presented in this report do not reflect App Store categories.

In-App Ad Sales

Estimates of in-app ad sales for iOS apps include revenue generated from the publishing of advertisements within apps only. Estimates do not include advertising on mobile web (such as on mobile browser apps) or search advertising, such as Apple Search Ads.

As in previous years, most of the billings and sales facilitated by the App Store ecosystem came from the sales of physical goods and services through iOS apps. Of those, general retail remained the largest category by far. Two other categories jockeyed for the next two spots: In 2021, food delivery and pickup temporarily surpassed travel as the second-largest category, while in 2022, travel once again was number two, with $102 billion in sales through the App Store. (See Figure 1.) The consistently high amount of sales of physical goods and services demonstrates that the App Store ecosystem continues to provide a trusted platform for developers to sell such products. For example, Apple Pay is an important tool that supports developers in this segment: Apple Pay offers a standardized, secure, and seamless way for customers to pay for physical goods and services in-app.

Figure 1: Estimated Billings and Sales Facilitated by the App Store Ecosystem by App Category, 2019-2022 ($ Billion)*



* Totals may not sum due to rounding.
** Billings and sales from digital goods and services are not the same as App Store billings.
*** iOS in-app ad revenue; does not include mobile web, search ads, and Apple Search ads.

Estimating the size of the App Store ecosystem

The direct monetization of apps represents a small fraction of the overall commerce the App Store facilitates, because developers can monetize their apps in several ways that do not involve payments through the App Store, such as:

1. Selling digital goods and services outside of the App Store for use within apps on Apple devices (e.g., news and magazine subscriptions, music and video streaming)
2. Selling physical goods and services through apps on Apple devices (e.g., food and grocery delivery or ride hailing)
3. Offering ad-supported content within apps (e.g., ad-supported games)

While our analysis captures the major app monetization strategies, we do not capture all of the ways in which the App Store ecosystem facilitates sales or all of the benefits created by apps. For example, we do not include benefits that companies derive from "companion apps" that raise the value of their goods and services, including smart home apps (e.g., Nest, Ring) and health apps, among many others.

A complete description of our methodology is included in the Appendix.

To read about our estimates of billings and sales facilitated by the App Store in 2019 and 2020, please see our previous reports: *How Large Is the Apple App Store Ecosystem?* and *A Global Perspective on the Apple App Store Ecosystem*.

Mobile general retail sales on iOS apps have increased by

64%

since 2020.

Global trends (2019-2022)

The App Store ecosystem grew 27% between 2020 and 2021 and 29% between 2021 and 2022, in line with the 27% growth from 2019 to 2020.[1] Overall, such growth is a sign of a flourishing marketplace, where apps innovate, grow, and compete.[i]

Each of the three top-level ecosystem categories grew each year, but at somewhat different rates. (See Table 2.) Specifically, iOS-app-based sales of physical goods and services accelerated, growing 30% from 2020 to 2021 and 34% from 2021 to 2022. In-app advertising in iOS apps continued to grow at high rates: Increasing 10% from 2020 to 2021 and 24% from 2021 to 2022.

The size of digital goods and services facilitated by the App Store grew by 19% from 2020 to 2021 before plateauing (up 2%) in 2022. These changes reflect a period of rapid growth in 2020 as people shifted to a more digital world during the pandemic, followed by a gradual transition through 2022 to a new normal, with sustained higher levels of digital billings and sales.

Billings and sales of digital goods and services consumed on iOS apps have increased by

21%

since 2020.

Digital goods and services: Within digital goods and services consumed on iOS apps, we saw large increases in 2020 in enterprise, education, and fitness apps, following a shift toward remote work, online schooling, and online fitness due to gym closures. Enterprise apps have continued to grow in popularity since the pandemic, and in 2022 represented one of the fastest growing digital goods and services categories in our ecosystem estimate of billings and sales, only behind app-based entertainment. In 2022, business-oriented apps represented five of the top 25 most downloaded apps in the US (Zoom, Microsoft Teams, Microsoft Outlook, Microsoft Intune Company Portal, and Authenticator). Billings and sales continued to increase significantly for all categories of digital goods and services in 2021 and then stabilized in 2022, as people had largely adapted to remote and hybrid models of work and school, and were returning to in-person activities in many regions of the world. Online dating services, for example, grew faster in 2021, as many people got vaccinated against COVID-19 and returned to in-person dating, and continued to grow in 2022.[ii]

One exception to the stabilization seen in other categories in 2022 was app-based entertainment services, a category that includes live-streaming apps, horoscope apps, and group chat apps, which saw the largest growth among digital goods and services categories. One notable trend within app-based entertainment services is the growth of apps supporting the creator economy in recent years; examples of these apps include live-streaming apps Twitch and BIGO LIVE, and chatroom app Discord.

1 All changes in this report are calculated using the most current figures for 2019 and 2020. We updated some of the estimates from our previous reports to account for (1) methodological improvements and refinements developed over time, and (2) retroactive changes made by third-party data sources. We rely on the updated numbers, rather than our original estimates, to calculate changes compared to 2019 and 2020, as they will more accurately reflect underlying trends, rather than methodological improvements or updates in third-party data. See Appendix for more details.

Physical goods and services: Looking at iOS-app-based purchases of physical goods and services, the consistent and substantial growth in 2021 and 2022 reflects multiple factors: A continued shift to buying goods and services through apps – in particular, for general retail, grocery, and travel; the dramatic growth of categories such as food delivery and pickup, and grocery delivery; the strong recovery of categories negatively affected by the pandemic, such as ride hailing and travel, following a return to in-person activities as vaccines were rolled out and pandemic restrictions were relaxed in many countries and regions in 2021 and throughout 2022; and global macroeconomic impacts, including inflation in some regions, changing interest rates, and foreign exchange headwinds from a strong US dollar.

iOS-app-based grocery sales increased nearly

3.5x

since 2019.

The category that experienced the largest growth in both 2020 and 2021 was iOS-app-based **grocery sales**.[2] The pandemic led many people to change their grocery shopping habits, buying groceries online – particularly on their iPhone – using delivery services or ordering ahead and picking them up at the store. These changes in habits were reflected in 67% growth from 2019 to 2020 and 74% growth from 2020 to 2021. iOS-app-based grocery sales stabilized in 2022, still increasing at a substantial rate of 20%, suggesting that this shift in consumer habits is here to stay. For the second year in a row, iOS-app-based grocery sales remained larger than ride hailing in the App Store ecosystem in 2022, making it the fourth largest m-commerce category.

iOS-app-based food delivery and pickup sales increased nearly

2.3x

since 2019.

Similarly, owing to pandemic restrictions on indoor dining and changes in consumer habits, sales of **food delivery and pickup** on iOS apps grew substantially throughout the pandemic (up 40% and 41% in 2020 and 2021, respectively), and continued to grow in 2022 though at a somewhat more modest clip (up 17%). This strong growth led food delivery and pickup to briefly become the second-largest m-commerce category in the App Store ecosystem (behind general retail) in 2021 before returning to third (behind general retail and travel) in 2022. The pandemic also continued to drive an increase in digital payments in 2021 (up 59%, compared to 54% in 2020) as contactless payment methods replaced cash, a shift that appears to reflect a longer-term change in payment methods (9% growth in 2022).

2 Grocery refers to purchases of food and beverages for pickup or delivery from the online stores of large supermarkets (e.g., Walmart), internet retailers (e.g., Amazon Fresh), dedicated grocery delivery services (e.g., Instacart), and subscription-based services (e.g., HelloFresh). Food delivery and pickup refers to orders of prepared meals from restaurants directly or through platforms (e.g., JustEat) for direct consumption.

General retail sales on iOS apps – the largest m-commerce component of the ecosystem – showed strong growth in 2021 (up 24%) and grew even more in 2022 (32%). This increase in general retail was partially driven by an increase in the share of iOS device usage in China,[iii] which has historically been the largest contributor to the general retail category.

As vaccines became available and pandemic restrictions were relaxed in 2021, **travel** and **ride hailing** reversed their pandemic-related declines. These two categories grew 47% and 30%, respectively, in 2021, and an impressive 84% and 45% in 2022. iOS-app-based sales in both categories in 2022 exceeded their pre-pandemic levels.

In-app advertising: Ad spend was substantially higher in 2022 compared to 2021. This was consistent with broader macro trends in the ad space, which had a strong year overall despite challenges from some individual players. The ad market saw strong growth for certain short-video apps, retail (e.g., Amazon), and podcasts, driving the overall increase in in-app advertising. The increase in iOS usage shares in China also drove some of this growth.

Table 2: Yearly Changes in the App Store Ecosystem, Worldwide, 2019-2022

	2019 to 2020	2020 to 2021	2021 to 2022
**Digital Goods and Services*, ** **	**+41%**	**+19%**	**+2%**
Physical Goods and Services	**+26%**	**+30%**	**+34%**
M-Commerce			
General Retail	+42%	+24%	+32%
Travel	-33%	+47%	+84%
Food Delivery and Pickup	+40%	+41%	+17%
Grocery	+67%	+74%	+20%
Ride Hailing	-33%	+30%	+45%
Digital Payment	+54%	+59%	+9%
In-App Advertising, *****	**+23%**	**+10%**	**+24%**
Total	**+27%**	**+27%**	**+29%**

* Billings and sales from digital goods and services are not the same as App Store billings.
** Changes between both 2019 to 2020 and 2020 to 2021 are based on updated numbers. See Appendix for more details.
*** iOS in-app ad revenue; does not include mobile web, search ads, and Apple Search ads.

Regional dynamics on the App Store ecosystem

The App Store ecosystem by region in 2022

In 2022, roughly as in previous years, the US accounted for almost 25% of the billings and sales facilitated by the App Store ecosystem, China[3] accounted for 51%, and Europe 11%. Physical goods and services were the largest category in each region. (See Table 3, as well as Appendix Table 2 for the analogous 2021 table.) Within physical goods and services, general retail dominated in all regions, with slight differences in the ordering of the other m-commerce subcategories.

Table 3: Estimated Billings and Sales Facilitated by the App Store Ecosystem, Large Regions, 2022 ($ Billion)*

	US	China	Europe****	Rest of the World	Total
Digital Goods and Services**	**$41**	**$21**	**$11**	**$30**	**$104**
Physical Goods and Services	**$182**	**$523**	**$93**	**$111**	**$910**
M-Commerce					
General Retail	$96	$411	$51	$63	$621
Travel	$27	$32	$21	$22	$102
Food Delivery and Pickup	$21	$36	$9	$11	$77
Grocery	$13	$25	$6	$8	$52
Ride Hailing	$22	$14	$6	$6	$48
Digital Payment	$4	$6	-	-	$10
In-App Advertising***	**$50**	**$25**	**$15**	**$19**	**$109**
Total	**$273**	**$570**	**$119**	**$160**	**$1,123**

* Totals may not sum due to rounding.
** Billings and sales from digital goods and services are not the same as App Store billings.
*** iOS in-app ad revenue; does not include mobile web, search ads, and Apple Search ads.
**** Europe includes countries in Western, Central, and Eastern Europe (including the UK and the Nordic Region, not including Russia).

3 Throughout the report, China refers to Greater China.

The UK remained the largest contributor to the App Store ecosystem in Europe, in part thanks to its large m-commerce sector and relatively high iOS market share. In most countries, general retail, travel, and food delivery and pickup remained the three largest subcategories within m-commerce. (Italy is an exception; see Table 4.)

Table 4: Estimated Billings and Sales Facilitated by the App Store Ecosystem, Select European Countries, 2022 ($ Billion)*

	UK	Germany	France	Italy	Spain
Digital Goods and Services**	**$3.2**	**$2.1**	**$1.3**	**$0.5**	**$0.3**
Physical Goods and Services	**$40**	**$15**	**$8.9**	**$3.4**	**$3.4**
M-Commerce					
General Retail	$23	$7.1	$5.4	$1.6	$1.7
Travel	$6.3	$4.8	$2.1	$1.3	$1.2
Food Delivery and Pickup	$5.1	$1.7	$0.5	$0.2	$0.2
Grocery	$2.7	$0.7	$0.5	$0.3	$0.2
Ride Hailing	$2.2	$0.5	$0.5	$0.1	$0.2
In-App Advertising***	**$4.8**	**$2.1**	**$1.8**	**$0.9**	**$0.5**
Total	**$48**	**$19**	**$12**	**$4.9**	**$4.2**

* Totals may not sum due to rounding.
** Billings and sales from digital goods and services are not the same as App Store billings.
*** iOS in-app ad revenue; does not include mobile web, search ads, and Apple Search ads.

We find that general retail remained the largest stream of iOS-app-based sales in both Japan and South Korea in 2022, while in Australia and New Zealand, travel became the largest m-commerce category within physical goods and services, ahead of general retail. Travel was the second largest category in Japan, while food delivery and pickup remained the second largest category in South Korea. (See Table 5.)

Table 5: Estimated Billings and Sales Facilitated by the App Store Ecosystem, Select Countries and Regions, 2022 ($ Billion)*

	Japan	South Korea	Australia and New Zealand
Digital Goods and Services**	**$14**	**$1.8**	**$1.9**
Physical Goods and Services	**$25**	**$26**	**$10**
M-Commerce			
General Retail	$14	$17	$3.6
Travel	$5.1	$2.6	$4.1
Food Delivery and Pickup	$1.8	$4.5	$0.7
Grocery	$3.4	$1.7	$0.9
Ride Hailing	$0.7	$0.5	$1.2
In-App Advertising***	**$7.1**	**$1.1**	**$2.1**
Total	**$46**	**$29**	**$14**

* Totals may not sum due to rounding.
** Billings and sales from digital goods and services are not the same as App Store billings.
*** iOS in-app ad revenue; does not include mobile web, search ads, and Apple Search ads.

Regional trends (2019-2022)

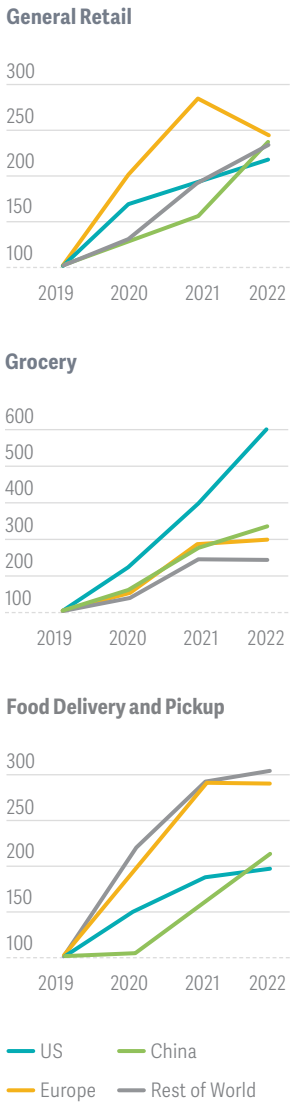
In the US, China, and Europe, billings and sales of digital goods and services facilitated by the App Store ecosystem stabilized between 2021 and 2022 as categories that initially grew during the onset of the pandemic plateaued in 2022, due in part to regulatory headwinds in the video game industry in China.[iv] In 2021 and 2022, by contrast, iOS-app-based sales of physical goods and services increased steadily in the US (up 26% and 20%), while growth in China almost doubled due to an increase in the adoption of iOS relative to Android (24% in 2021 compared to 52% in 2022). While the digital goods and services and physical goods and services categories were stable in Europe between 2021 and 2022, this is at least partially attributable to the strong US dollar compared to the euro and British pound. In local currency, the eurozone grew comparably to the United States. Over the longer, three-year time frame, the size of the ecosystem doubled in Europe and China and grew by more than 80% in the US. (See Table 6.)

Table 6: Yearly Changes in the App Store Ecosystem, Large Regions, 2019-2022

	US			China			Europe****		
	'19 to '20	'20 to '21	'21 to '22	'19 to '20	'20 to '21	'21 to '22	'19 to '20	'20 to '21	'21 to '22
**Digital Goods and Services*, ** **	**+51%**	**+17%**	**+7%**	**+30%**	**+18%**	**+6%**	**+44%**	**+28%**	**+1%**
Physical Goods and Services **	**+26%**	**+26%**	**+20%**	**+23%**	**+24%**	**+52%**	**+54%**	**+49%**	**+2%**
M-Commerce									
General Retail	+69%	+15%	+12%	+30%	+20%	+50%	+101%	+41%	-15%
Travel	-37%	+76%	+54%	-27%	+7%	+158%	-33%	+77%	+79%
Food Delivery and Pickup	+52%	+24%	+5%	+4%	+56%	+37%	+96%	+50%	-0%
Grocery	+128%	+77%	+52%	+65%	+69%	+21%	+54%	+88%	+4%
Ride Hailing	-41%	+27%	+32%	-21%	+8%	+108%	-13%	+53%	+18%
Digital Payment	+186%	+57%	-9%	+10%	+60%	+24%	-	-	-
In-App Advertising, *****	**+28%**	**+4%**	**+22%**	**+19%**	**+15%**	**+49%**	**+21%**	**+22%**	**+8%**
Total	**+30%**	**+20%**	**+18%**	**+23%**	**+24%**	**+50%**	**+47%**	**+43%**	**+2%**

* Billings and sales from digital goods and services are not the same as App Store billings.
** Changes from both 2019 to 2020 and 2020 to 2021 are based on updated numbers. See Appendix for more details.
*** iOS in-app ad revenue; does not include mobile web, search ads, and Apple Search ads.
**** Europe includes countries in Western, Central, and Eastern Europe (including the UK and the Nordic Region, not including Russia).

Categories with Sustained Increases in Sales, 2019-2022



The above figures show sales between 2019 and 2022, indexed on 2019 (i.e., 2019=100). The underlying data behind sales of physical goods and services categories were retroactively updated from previous reports. Figures are produced based on updated numbers for 2019 and 2020.

Between 2019 and 2022, the categories of iOS-app-based purchases of physical goods and services saw large changes across regions.

Sustained increases in general retail, grocery, and food delivery categories in the US and China; slower growth or decreases in Europe. In 2020, we saw large increases in the general retail, grocery, and food delivery and pickup categories in the US and Europe, a trend that continued in 2021 as more consumers used apps for purchases. Food delivery apps such as DoorDash (US) and Deliveroo (Europe) expanded their reach.[v] Grocery delivery startups such as Weee (US) are launching and growing as a result of these shifts,[vi] and major grocery retailers such as Tesco (UK) are moving to in-app ordering. Some of these trends slowed in 2022, particularly food delivery in both regions and general retail in Europe.

In 2021, grocery and food delivery and pickup increased the most in China, with growth rates of 69% and 56%, respectively. The lockdowns and strict quarantine measures in China that followed the rise of new coronavirus variants and outbreaks were likely the drivers of these changes.[vii] In 2022, the growth rates for grocery and food delivery remained high (21% and 37%). (See Sidebar.)

iOS-app-based general retail sales increased more than

2x

in all regions since 2019.

iOS-app-based grocery sales in the US increased

6x

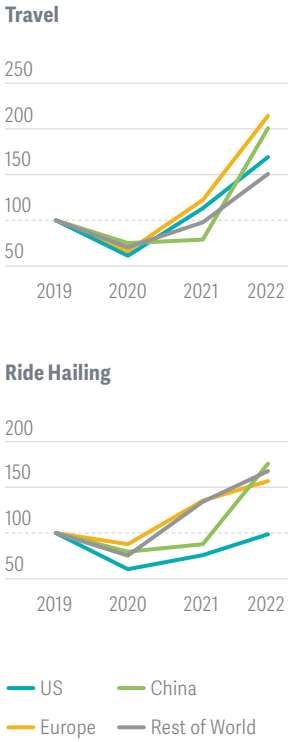
since 2019.

iOS-app-based food delivery and pickup sales in Europe and China increased more than

2x

since 2019.

Categories with Rebounding Sales, 2019-2022



The above figures show sales between 2019 and 2022, indexed on 2019 (i.e., 2019=100). The underlying data behind sales of physical goods and services categories were retroactively updated from previous reports. Figures are produced based on updated numbers for 2019 and 2020.

A continuing rebound in travel and ride hailing. The travel and ride hailing categories declined in all major regions in 2020, as mobility and tourism halted worldwide. In 2021, these categories rebounded in the US and Europe, with both categories rising above pre-pandemic levels in Europe. China followed suit in 2022, reflecting the differing impact of the pandemic and restrictions on travel in different regions. The increase in travel-related in-app spend reflects the changing consumer m-commerce trends towards one-stop-shop convenience. Major airlines now have dedicated apps to help plan and book travel. In 2022, travel was well above pre-pandemic levels in all regions; ride hailing was as well, except in the US, where it was back to its pre-pandemic level. (See Sidebar.)

In the US, iOS-app-based travel-related sales increased

54%

since 2021.

In Europe iOS-app-based ride hailing sales increased

58%

since 2019.

A rebound in in-app ad revenue in the US and China. In-app advertising revenue was substantially higher in both the US and China in 2022 compared to 2021 (up 22% in the US in 2022 compared to 4% in 2021, 49% in China in 2022 compared to 15% in 2021). This growth was driven by ad spend in non-gaming apps such as video apps, retail apps, and podcasts.

Looking ahead

While the world in 2021 began to adjust to a "new normal" in which hybrid models and in-app purchases became increasingly prevalent, COVID-19 pandemic-driven restrictions gradually relaxed or phased out across regions throughout 2022. 2022 also came with global and economic challenges, such as the war in Ukraine, regulatory headwinds in the video game industry in China, higher gas prices, supply chain disruptions, inflation, higher interest rates, and foreign exchange headwinds. On the App Store ecosystem, in-app purchases of digital goods and services stabilized, while the growth in in-app purchases of physical goods and services and in-app advertisement was strong. We anticipate that the App Store ecosystem will continue to evolve and adapt to the dynamic needs of customers across regions.

Fifteen years of the App Store

By the Numbers

iOS APPS AND USER CHOICE

370+ billion
downloads since 2008

123x more apps available now compared to the end of 2008

15x more annual downloads in 2022 than 2009

650+ million average weekly visitors to the App Store

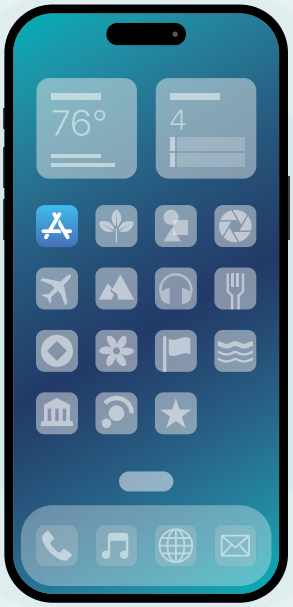
DEVELOPER GROWTH

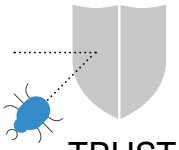
$320+ billion
developer earnings since 2008

126x more earnings in 2022 than 2009

200+ countries with active developers in 2022 (vs 69 in 2008)

54% downloads from outside developers' home country





TRUST AND SAFETY

1.7 million App Store submissions rejected in 2022

$5+ billion in fraudulent transactions prevented since 2020

SUPPORT FOR DEVELOPERS

40+ SDKs & **250,000** APIs

Education
Developer Academies, Apple-certified trainings, Entrepreneur Camps, and learn to code programs

More ways
to process payments:

50 storefronts with carrier billing

20+ storefronts with third-party electronic wallets

40+ billion average weekly automatic app updates

An explosion of opportunities and choices

The App Store was the first of its kind when it opened in 2008. For the past 15 years, it has offered a seamless and trusted way for users to download apps and new technologies. In doing so, the App Store has supported an explosion of opportunities for developers of various types of apps, leading to a proliferation of app-based products and services across app categories for consumers.

Our 2022 study, *"The Success of Third-Party Apps on the App Store,"* provides more detail on how the options for developers and content creators to reach consumers have changed over time.

Users can now choose from tens of thousands – sometimes hundreds of thousands – of apps across more than 20 categories that they can download. **Users today have access to over 123 times more apps than they did at the end of 2008.** Annual downloads on the App Store have increased 15-fold between 2009 – the first full year the App Store was in operation – and 2022. Since the launch of the App Store, users have downloaded apps more than 370 billion times.

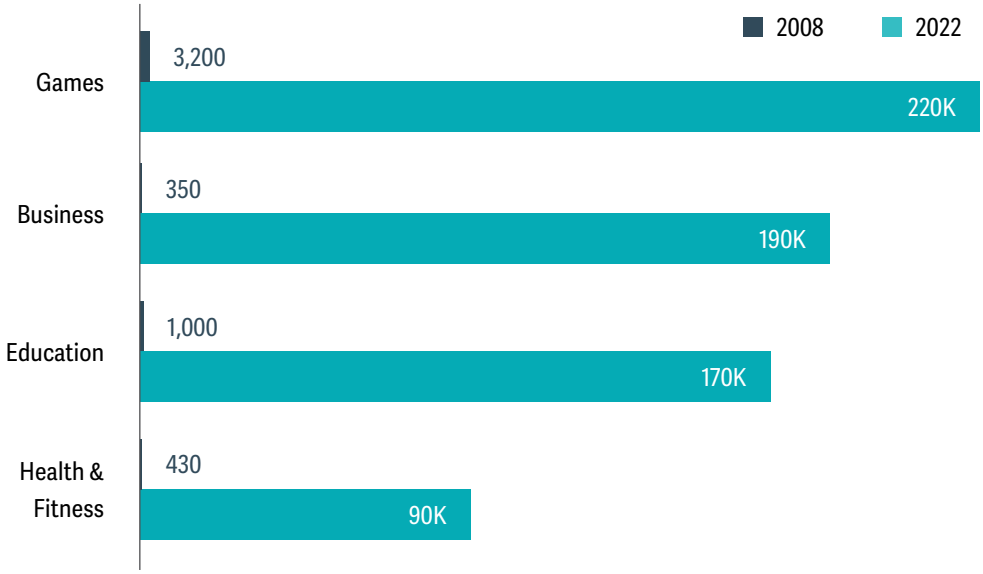
Developers of all sizes from all over the world have found opportunities on the App Store. At the end of 2008, developers who published apps on the App Store hailed from 69 countries; today, they come from nearly every country in the world. The share of developers from regions other than the US and Europe has grown from 18% to 48% between the end of 2008 and 2022, with the share of developers from China climbing from 1% to 12%. The App Store provides opportunities for developers to distribute their apps globally: In 2022, 54% of downloads occurred in storefronts outside of developers' home countries.

Developers earned over $320 billion in total on the App Store between 2008 and the end of 2022, and yearly developer earnings have grown 126-fold between 2009 and 2022. Monetization options have expanded: When the App Store started, developers could only monetize their apps directly via the App Store through app purchases; now, app purchases are responsible for less than 1% of earnings. In-app purchases account for the majority of developer earnings (about two-thirds), and subscriptions, which now account for about one-third of earnings, are growing. Subscriptions have been increasing globally, and are offered by many different businesses, ranging from physical bookstores, to e-commerce stores, to streaming platforms.[viii] The App Store is no exception, and developers have embraced this global trend. The App Store provides features like the ability to cancel subscriptions easily, as well as a reduced developer commission rate on revenue from subscriptions after the first year. Over the years, more and more developers across different categories have embraced subscriptions as their preferred monetization strategy.

Many segments have seen an enormous increase in choices for users and opportunities for developers on the App Store. By the end of 2008, for example, users could choose from only 3,200 games; by the end of 2022, they could choose from nearly 220,000, more than a 60-fold increase. Business apps have become more important for users in recent years, especially during and in the aftermath of the COVID-19 pandemic: The App Store went from hosting only 350 business apps at the end of 2008, to over 190,000 by the end of

2022. Also, both education and health and fitness are important categories that now offer consumers tens of thousands of choices.

Figure 2: Number of iOS Apps at the End of 2008 and 2022, Select App Store Categories



This increase in choices has transformed many aspects of our daily life. As just one example, consider how the experience of going on a trip has been transformed by apps. Prior to the App Store, a typical travel experience included printing paper boarding passes from one's computer, waiting at a taxi stand or bus stand for a ride from the airport to one's destination, using unwieldy folding maps to navigate a new city or expensive and clunky GPS devices while driving, and waiting to get back home to share photos and videos with family and friends. Since the advent of the App Store, this experience has been transformed: Mapping apps make it easier to navigate a new destination and find reviews of attractions and restaurants, ride hailing apps allow travelers to get around an unfamiliar city, and communication and social media apps allow travelers to share photos and videos in real time.

Supporting new and growing sectors of the economy

The ability to distribute software – specifically, apps – seamlessly through hundreds of millions of devices, paired with Apple's hardware and software advances, made entirely new types of apps possible and allowed other categories of apps to scale massively.

- **Mobile gaming**: In the early days, mobile games such as Tetris and solitaire offered a simple experience to pass the time. Since then, advances in hardware, software, graphics, and screen quality have led to an explosion of mobile gaming. Games that use heightened processing capabilities, realistic graphics, and augmented reality provide a state-of-the-art gaming experience without the need to buy a console.
- **Transportation platforms and food delivery**: Since launching nearly 10 years

Examples of apps from new and growing sectors of the economy

Honkai: Star Rail (China, 2023) is a role-playing space fantasy game that was one of the most highly anticipated and successful RPG releases of 2023.

Weee! (US, 2014) is a grocery delivery app that allows users to shop for Asian and Latino food options.

Ten Percent Happier (US, 2015) is a meditation app that helps users start and sustain a mindfulness practice.

Twinkl (UK, 2017) is an educational app that provides teachers access to a variety of educational resources, including worksheets, lesson plans, educational games, and more.

ago, ride hailing platforms have revolutionized how people get around worldwide, leveraging riders' and drivers' use of connected devices that can track their locations. This new paradigm has been extended with the emergence of micro-mobility apps that offer bike, e-bike, and scooter sharing, and car sharing apps that allow users to rent a car for a few hours. Similarly, food delivery apps connect a network of customers, restaurants, and delivery drivers by taking advantage of mapping and location technology. Apps give users and workers the ability to complete these transactions without needing to carry cash or credit cards.

- **Music streaming and video streaming**: The ability to stream content at any time and in any place contributed to the expansion of music and video streaming services. Improvements in battery life, screen size, and screen quality have made watching content on iPhone and iPad more enjoyable. Additionally, digital rights management features, such as technology that prevents users from screen recording while the video is playing, have helped protect content owners and allowed video streaming services to flourish.
- **Education**: Education apps are used by teachers, parents, and students to support learning. Apps can help teachers manage classrooms, communicate with parents and students, and help students study or explore new topics. The use of education apps to support learning also increased during the pandemic when in-person schools were temporarily closed. Outside of the classroom, apps have also helped people of all ages learn new languages and new skills.
- **Connected home devices**: The App Store has also enabled a new generation of physical products like smart thermostats, doorbells, locks, baby monitors, and light bulbs, which make users' homes more comfortable, functional, and secure. Users' ability to remotely control these devices or view the data they collect via apps has greatly improved their utility.
- **Civic engagement**: Governments increasingly rely on apps to facilitate interactions with citizens. For example, apps allow citizens to report non-emergency issues, check the schedule of trash pickup, find federally funded health centers, or apply for assistance after an emergency. During the COVID-19 pandemic, public health authorities created apps to track exposure through the Exposure Notifications APIs developed by Apple and Google, and to provide citizens access to COVID-19 screening tools and information, among other features.

Connected home devices

The market for connected home devices has grown quickly over the last five years.[ix] In 2022, categories of connected home devices that typically rely on apps to control, and sometimes use, the device and view data generated $49 billion in global revenue.[x] These devices include security devices like **Ring** and smart camera, home entertainment devices like **Sonos,** energy management tools like **Nest,** and comfort and lighting tools like GE's smart light bulbs controlled by the **Cync** app.

The growth of connected home devices has been a global phenomenon: For example, $13 billion in revenue came from Europe in 2022.[xi] Global manufacturers of connected home devices include **Siemens**, a multinational corporation headquartered in Germany that offers a suite of connected home devices controlled via an app; **Arkifi**, a Chilean-based company offering smart locks; and **tado°**, a German-based company producing smart thermostats.

Supporting users' everyday health

Users can find thousands of apps on the App Store to help them adopt healthier lifestyles. Many of these apps take advantage of Apple's HealthKit API, which allows the use of sophisticated sensors on iPhone and Apple Watch, while ensuring that user data is safe according to Apple's rigorous privacy and data security protocols. In addition, there are an increasing number of connected devices that work alongside HealthKit-enabled apps. Popular consumer-targeted health apps include:

- Running apps like **Nike Run Club**
- Fitness apps like **MyFitnessPal**
- Sleep apps like **Rise: Energy & Sleep Tracker**, **SnoreLab**, and **Pillow**
- Meditation and mindfulness apps like **Calm**, **Headspace**, and **Ten Percent Happier**
- Hearing-related apps like **SonicCloud**
- Nutrition apps like **WeightWatchers** and **Lose It!**
- Medication and symptom tracking apps like **Pt Pal Pro** and **Medisafe Medication Management**
- Apps that work alongside connected devices like **Qardio heart health** to measure blood pressure, **Withings Health Mate** to measure weight, and **ReSound** to work alongside hearing aids

New ways to engage with customers and to lower costs

Many traditional businesses have used apps in innovative ways to improve their customer experiences and/or provide their services more efficiently. For example, airlines have developed apps that provide an ever-growing array of features for their customers. Through apps, users can conveniently store and access mobile boarding passes, check flight status, modify reservations, receive gate and baggage updates, access the plane's entertainment system, and more. Some of these features have reduced costs as well, such as the cost savings from phasing out in-flight entertainment system screens or printing paper boarding passes.[xii,xiii]

Similarly, banks have developed apps that facilitate mobile check deposit using the phone camera, send fraud alerts, and allow customers to quickly check balances or transfer money. The extra convenience for consumers has also led to lower costs for banks from the reduction in in-person visits to physical branches.[xiv] Supermarket apps allow consumers to order items on the go, check savings and deals, look up store maps and aisle locations, scan items for prices, and pay directly through the app.

App-based innovations also extend to cultural and recreation activities: Visitors to art museums can now use mobile apps to take a wide variety of self-guided tours or listen to audio descriptions of individual artwork that catch their attention. Theme parks have apps that allow visitors to view wait times for popular rides, navigate the park, and view activity schedules. Many ski resorts now offer apps that allow visitors to check real-time weather conditions and forecasts, get updates on lift closures, and view trail maps.

Examples of apps that provide new ways to engage with customers

United Airlines (US, 2011) United Airlines' app allows users to book flights, access in-flight entertainment, pay for in-flight snacks and drinks, check in for flights and download boarding passes, track bagages, and more.

USAA (US, 2009) United Services Automobile Association was one of the first financial service companies to offer mobile check deposit using iPhone's camera.

John Lewis & Partners (UK, 2011) is a department store app that allows users to browse products, use augmented reality features to "try before you buy," and get notifications when products are back in stock.

Innovations from healthcare providers and the medical community

Healthcare providers and the medical community use apps to deliver cutting-edge care to patients and conduct groundbreaking research. These apps include:

Epic Rover, which helps manage clinical communication by pairing iPhones with patient charts and has a scanning feature to streamline the administration of medication.

StrivePD, which uses Apple's Movement Disorder API to help measure and record tremors and muscle movements associated with Parkinson's disease.

Butterfly iQ+, a handheld ultrasound device that was built using Apple's developer tools and has expanded access to ultrasound imaging.

Epic's **MyChart** app, which is integrated with HealthKit and paired with third-party medical devices (for example, blood pressure cuffs and glucose monitors), and provides digital medicine programs for patients with hypertension and diabetes.

One Medical, which allows patients to participate in telehealth video appointments in the app, schedule visits, message with providers via video or chat, manage prescriptions, and view health records.

Apple Research, built on the ResearchKit framework, which is broadening the scope of possibilities for researchers while maintaining complete control over data sharing for participants.

The need to encourage platform usage on both sides

Scholarship in economics and business strategy shows that **digital marketplaces create value by facilitating interactions between different sets of users.**[xv] The App Store, a digital marketplace, makes it easier for Apple iOS device owners and developers to interact. This means that the App Store has the incentive to bring both sides on board and encourage their interactions.[xvi] Apple benefits if iOS users have more positive experiences downloading and using apps, and if developers have the tools and support from Apple to create better apps.

To succeed, digital marketplaces need to actively manage the interactions between developers and iOS users and create trust to ensure continued participation from both sets of users.

To do so, digital marketplaces rely on technology, processes, and policies to improve the quality of interactions on the platform.[xvii] This is an iterative process that requires work and investment, adjusting to changing conditions, and incorporating new technologies as they become available.

Apple's focus on device owners and developers contributes to making the App Store a vibrant marketplace with over **650 million average weekly visitors**, and over 747 million and 1.5 billion average weekly downloads and redownloads, respectively.

1.7m
App Store submissions rejected in 2022

$5b+
in fraudulent transactions prevented since 2020

950,000+
apps rejected for privacy violations since 2020

690m+
fraudulent customer accounts deactivated since 2020

Apple device owners: Providing a safe, secure, and private platform for users to discover new apps

Trust and safety have been central to the growth in app downloads and usage over time. Compared to the early 2000s, when downloading software always came with the risk of infecting the device with a virus or becoming victim to a scam, the App Store has brought peace of mind to users downloading apps. Apple's unique approach integrates hardware, software, and other services, such as safe payment options, to provide users with a secure and private experience to discover and enjoy new apps. Apple's policies and rules, for example for App Review, ensure the App Store remains a safe marketplace.

Apple has heavily invested in the development of policies to foster user trust and the deployment of resources to enforce them. Many of these rules apply even before apps are released on the App Store. Before submitting new apps for review, Apple requires developers to provide detailed information about how the apps, and any third-party products integrated into the apps, deal with privacy and user data. Once developers submit their apps, Apple's screening mechanisms ensure that apps and all in-app content meet the App Store Review Guidelines, are periodically updated, and do not represent a privacy risk for users. Additionally, automatic app updates make it easy and seamless for users to have the latest and safest app versions. Apple has also developed multiple mechanisms to remove bad actors and prevent fraud on the App Store, including by removing fraudulent reviews, removing fraudulent users and developers, and preventing payment and credit card fraud.

Support for students

through programs such as "Everyone Can Code," "Develop in Swift", and "Swift Playgrounds"

Support for new developers

through Developer Academies and Apple-certified trainings

Support for iOS entrepreneurs

through Entrepreneur Camps, App Accelerators, and developer workshops around the world

Our 2021 study, *"A Global Perspective of the Apple Ecosystem,"* provides more details on how Apple supports developers.

Serving Developers: Tools to foster success

Apple's continual investments in the iOS ecosystem facilitates the development and discovery of new apps, gives developers the ability to add new functionality to their existing apps, and provides access to metrics to track app usage.

Since 2008, Apple has released over **40 SDKs and 250,000 APIs** for developers, including HealthKit (2014), which provides a secure option to create apps based on user health data, and the Metal API, which can improve running time and be used to create state-of-the art 3D designs for games. Technical tools like **Xcode** and **Swift** (2014) lower the technical barriers to design, and make it easier to debug and optimize apps. And testing tools such as **TestFlight** (2014) connect developers and users during the app's testing phase. Apple also provides developers with the option to collect data on app performance, which can inform improvements to their apps.

Apple's **App Analytics tools**, such as "Peer Group Benchmark," allow developers to track the performance of their apps by monitoring downloads, active sessions, paying users, and in-app content.

The App Store gives developers **multiple alternatives to monetize their apps**, including by offering subscriptions and/or employing different business models (free, freemium, paid, paymium). It also supports **many payment methods**, including payments in local currencies, carrier billing (which allows users to pay developers through their monthly phone bill), Apple Pay, and other methods that leverage third-party companies.

73

storefronts where Apple offers the option to pay in local currency

50

storefronts that offer carrier billing, including O2 in Germany (2015), BYT in France (2017), Optus in Australia (2019), and WOM Nextel in Chile (2022)

26

storefronts that offer third-party electronic wallets including Alipay in China (2016), Kakaopay in Korea (2019), and Dana in Indonesia (2020)

Thanks to the App Store, developers can seamlessly distribute their apps around the world and make sure users discover their apps. **The App Store facilitates on average more than 747 million app downloads, 1.5 billion redownloads, and 40 billion automatic app updates each week**. The App Store's global marketing team, editors, and the "Today," "App of the Day," and "Game of the Day" features are examples of how Apple helps developers drive discovery of their apps.

Appendix

Appendix Table 1: Breakdown of Where Apple Collects a Commission on Billings and Sales Facilitated by the App Store

Billings and Sales Facilitated by the App Store Ecosystem: $1,123 Billion

No commission: More than 90%

Commission: Less than 10%

Apple does not collect a commission on:

- **Digital goods and services** that are purchased *outside* of the App Store, for example:
  - * Subscriptions to multiplatform video streaming apps like Hulu
  - * Subscriptions to audiobook apps like Audible
  - * Subscriptions to music streaming apps like Spotify
  - * Subscriptions to news and magazine apps like the NY Times
- **Physical goods and services** ordered within-app, for example:
  - * Ordering a ride through the Uber app
  - * Placing an order on the Amazon app
  - * Ordering grocery delivery through Instacart
  - * Transaction fees on digital payments occurring through apps
- **In-app advertising** for apps that make money through in-app advertising, for example:
  - * Non-gaming apps like Pinterest and YouTube
  - * Gaming apps like Rolly Vertex and Helix Jump

Apple collects a commission on:

- **Digital goods and services** that are purchased *in* or *through* the App Store, for example:
  - * In-app subscriptions to multiplatform video streaming apps like Hulu
  - * In-app subscriptions to education apps like Duolingo
  - * In-app purchases of a game's bonus features
  - * In-app subscriptions to news and magazine apps like the NY Times

Appendix Table 2: Estimated Billings and Sales Facilitated by the App Store Ecosystem, Large Regions, 2021 ($ Billion)*

	US	China	Europe****	Rest of the World	Total
Digital Goods and Services**	**$38**	**$20**	**$11**	**$33**	**$102**
Physical Goods and Services	**$153**	**$344**	**$91**	**$90**	**$678**
M-Commerce					
General Retail	$86	$273	$60	$52	$471
Travel	$17	$13	$12	$14	$56
Food Delivery and Pickup	$20	$26	$9	$11	$66
Grocery	$8	$21	$5	$8	$43
Ride Hailing	$17	$7	$5	$5	$33
Digital Payment	$4	$5	-	-	$9
In-App Advertising***	**$41**	**$17**	**$14**	**$16**	**$88**
Total	**$232**	**$381**	**$116**	**$139**	**$868**

* Totals may not sum due to rounding.
** Billings and sales from digital goods and services are not the same as App Store billings.
*** iOS in-app ad revenue; does not include mobile web, search ads, and Apple Search ads.
**** Europe includes countries in Western, Central, and Eastern Europe (including the UK and the Nordic Region, not including Russia).

Methodological approach

To arrive at our results, we distinguish among three primary app monetization strategies that developers use:

- **The first monetization strategy is to sell and distribute digital goods and services.** Sales and distribution of digital goods and services can occur through the App Store in the form of paid app downloads and in-app purchases, or through the sale of digital content and subscriptions from multi-platform apps that allow for the use and consumption of the app, both on the App Store ecosystem and elsewhere. Examples of apps using this monetization strategy include those for gaming, dating, video and music streaming, fitness and health, and news and magazines.
- **The second monetization strategy is to sell physical goods and services through the app.** Apps using this monetization strategy are m-commerce apps generally, including apps for ride hailing, food delivery and pickup, grocery delivery and pickup, general retail, and travel, as well as digital payment apps.
- **The third monetization strategy is to sell in-app advertising.** Examples of apps using in-app advertising as their primary monetization strategy are social media and short video sharing apps.

We employ different methodologies to estimate billings and sales facilitated by the App Store ecosystem for each of these monetization strategies. In so doing, we rely on a variety of data sources, including data from Apple, app analytics companies, market research firms, and individual companies. To ensure the reliability and robustness of our estimates, we validate and compare key inputs from different data sources.[4]

We are continually working to improve on our methodology and to adjust for changes in underlying third-party data. As a result, estimates and changes seen throughout this report may differ from those presented in previous years' reports. Where and when applicable, we have made note of reliance on updated estimates.

Sales and distribution of digital goods and services

Apps used to sell and distribute digital goods and services fall into two subcategories:

- Certain app developers choose to monetize their iOS apps only through the App Store, and those apps can only be used on the iOS platform.[5] Most billings from these apps come from games, which involve a one-time payment or, more often, in-app payments that allow app users to remove ads, unlock bonus levels, or access premium features.[6] This category also includes most photo-editing apps and dating

4 This methodological approach is consistent with the one used in our 2019 and 2020 App Store ecosystem studies.

5 Developers may also offer the same digital goods and services through apps on other platforms, such as Android.

6 Our analysis does not include billings generated from the Apple Arcade gaming service. Apple Arcade provides participating developers with an additional business model – distinct from the App Store – in which Apple supports the development costs of Apple Arcade games. Many small and independent developers with games in Apple Arcade also monetize with other free-to-play or paid games on the App Store.

apps, as well as apps for short video, among others.

- Other apps allow for the consumption of digital goods and services both within the App Store ecosystem and elsewhere. These so-called multi-platform apps allow consumers to pay through either the App Store or another platform or device. In other words, consumers use non-device-specific subscriptions or purchases to enjoy the digital goods and services provided. Multi-platform apps can be further divided into consumer apps and enterprise apps.

  - **Consumer apps** typically offer paid digital content – such as movies, music, audiobooks, news, meditation courses, and fitness classes – that can be consumed within the app. Moreover, they may offer paid digital services obtained on the app, such as educational services, password management, job search, and access to job platforms.
  - **Enterprise apps** allow businesses and organizations to provide tools and capabilities through smartphones and tablets. These include communication and collaboration apps, mobility management solutions, cloud-based business apps, and file hosting services. These apps usually make money by selling subscriptions to corporations and institutions outside of the App Store.

To distinguish between these two subcategories of apps, we manually review the most popular apps in each App Store category, focusing on their business models and monetization strategies. We use this information to ascertain (1) whether the app can be used on mobile or computer browsers, or on a different app platform; and (2) whether an app on an Apple device can be used through a subscription or purchase made outside the App Store.

Methodology for iOS apps that sell only through the App Store

For iOS apps that sell digital goods and services only through the App Store, we count total billings, which include Apple's commission.[7] We use billings because they represent the total amount customers pay.

7 In 2022, Apple's commission rate was 30% for the sale of digital goods and services; for subscriptions, it was 30% for the first year and 15% for any subsequent years. Developers who made up to $1 million in 2021 for all of their apps, as well as developers new to the App Store, qualify for the Small Business Program and pay a reduced commission of 15%.

Methodology for multi-platform apps

Background. For multi-platform apps, estimating the volume of sales facilitated by the App Store is complex because subscriptions and purchases associated with them are not device specific. The lack of device-specificity creates a dual challenge:

- First, consumers can pay to access multi-platform digital goods and services in different ways, regardless of where they consume those goods and services. In some cases, consumers pay through the App Store, but sometimes they do not.
- Second, multi-platform apps allow users to access content and services across different devices, including non-Apple devices. For example, consumers can stream videos through smart TVs, connected TV devices, video game consoles, smartphones, tablets, and web browsers, and across different platforms (Apple, Android, etc.).

Because of these two characteristics of multi-platform apps, billings that flow through the App Store are not necessarily a reliable indication of Apple users' engagement with multi-platform apps. Consequently, we must be deliberate about attributing the appropriate share of billings and sales to the App Store ecosystem.

Example. To illustrate these challenges, consider the video streaming service Hulu. The Hulu app is free to download, but a subscription is necessary to watch content on the iPhone, iPad, and Apple TV apps. A Hulu subscription can be purchased in one of two ways:

- Through the Hulu app on an Apple device, in which case the purchase happens through the App Store. But a subscription purchased through the App Store can also be used to watch Hulu on other platforms. Consequently, it would be incorrect to attribute all of the App Store billings (the full subscription amount) to the App Store ecosystem because it would overstate the value of the Hulu product enjoyed on Apple devices specifically.
- Outside of the app (on a Mac or PC via web browser, for example), in which case the purchase does not happen through the App Store, and there are no App Store billings. However, the subscription can be used to watch content on Hulu using apps on Apple devices. Consequently, it would be incorrect to use the App Store billings (which are zero) as an input to our App Store ecosystem results, because it would understate the value of the Hulu product enjoyed through apps on Apple devices.

Methodology. To address these challenges, we generally do not rely on App Store billings for multi-platform apps. Instead, we rely on the proportion of use that occurs on apps in the App Store ecosystem to estimate how much of the total sales of multi-platform apps (App Store plus non-App Store) is facilitated by the App Store ecosystem.

Consider, for example, not just Hulu but the entire video streaming industry, a market with more than $30 billion in total annual sales in the US in 2022.[xviii] Users consume video streaming content over a mix of smartphone apps, tablet apps, desktop browsers, smart TVs, connected TV devices, and video game consoles. To estimate the volume of sales facilitated by the App Store ecosystem, we first take the portion of hours streamed on smartphone apps, tablet apps, and smart TVs of all types. We then apportion this share to Apple devices specifically, using the Apple market share for each device category.

Using this framework and approach, we estimate the volume of sales facilitated by the App Store ecosystem for several categories of apps offering similar types of goods and services. The app categories for which we estimate sales facilitated by the App Store are video and music streaming, e-books and audiobooks, newspapers and magazines, and enterprise. We use third-party research to account for the variation in users' app consumption habits across categories and countries. For example, consumers often listen to music and audiobooks through apps on mobile devices, while they are more likely to stream videos on smart TVs. Those consumption habits may also vary by geography. Additionally, when the data are available, we take into account any variation in the consumption patterns of iOS (and non-iOS) users by app type and geography.

For each app category, we estimate total sales by geography by relying on inputs from third-party sources, typically market research firms.[xix] We then apportion those sales using the share of content consumed on apps on any platform by geography, based on information collected from marketing surveys, company reports, or data on usage patterns.[xx] Finally, we apportion usage to Apple iOS devices specifically by using the iOS market share for each device category in each geography.[xxi]

We use a more tailored approach for enterprise apps for a number of reasons. First, usage patterns are more heterogeneous for enterprise apps. Second, app-based usage and desktop-based usage of enterprise products tend to be more integrated. Third, the pricing of enterprise products is less transparent and more complex than for consumer apps.

With these complexities in mind, we individually estimate sales from 10 major enterprise apps or families of apps; Microsoft Office 365, Google Workspace (i.e., enterprise versions of Google productivity tools such as Gmail and Google Docs), Adobe (Acrobat), WPS Office, Dropbox, Box, Baidu Drive, Webex, Zoom, and Slack. We also include an aggregate market-level estimate for mobility management apps, which allow employees to securely access business content.

Finally, for some categories of apps, we use billings from the App Store as a proxy for sales facilitated by the App Store ecosystem. We do this for categories of apps, such as education or fitness apps, for which consumers typically consume the content within the app but may purchase it outside of the App Store. This methodology likely results in a conservative (or lower) estimate compared with an estimate relying on usage-based apportionment.

Sales of physical goods and services through the app

Many developers monetize their apps by selling physical products through their apps. These include:

- Apps that let customers **purchase physical goods and services**. We broadly refer to these as m-commerce apps. The group includes apps for general retail, ride hailing, food delivery and pickup, grocery delivery, and travel.
- Apps that enable **digital payments or transfers**, such as mobile point-of-sale apps that rely on QR codes and peer-to-peer transfer apps.

M-commerce

Globally, mobile apps are an increasingly important e-commerce channel due to their convenience. This growth has been most pronounced in China, the leader in m-commerce.[8] Apps of retailers such as Amazon and Target allow consumers to browse and purchase physical goods directly in the app and offer in-store pickup or delivery. In addition, mobile apps – including those for ride hailing, food delivery and pickup, grocery delivery and pickup, and mobile pickup ordering – have been central to the creation or expansion of certain business models.

Sales on m-commerce apps do not flow through the App Store.[9] We therefore use third-party data to estimate the volume of sales of physical goods and services from transactions on mobile apps.[10] We provide results for several categories of apps: general retail, food delivery and pickup, travel, grocery, and ride hailing.

For many of our m-commerce categories, we rely on Statista's Digital Market Outlook and Mobility Market Outlook data for online sales revenue. In 2022, Statista updated their methodology to estimate industry revenues to use current exchange rates, rather than fixed exchange rates, with the goal of being more accurate. As a result, their 2019, 2020 and 2021 estimates were retroactively updated.

For each app category, we estimate the total volume of e-commerce or m-commerce sales by geography, relying on estimates of third-party sources, typically market research firms.[xxii] We then apportion the volume of sales, if necessary, to purchases that occur via smartphone and tablet apps. For example, for online food delivery and pickup, customers may place orders via an app, a mobile browser, or a desktop browser. We estimate the share of each app category's sales that occur via mobile apps, within each geography,

8 In China, more than 80% of online retail is mobile. Additionally, most mobile commerce occurs through apps and to a lesser – but increasing – extent through "mini-programs" on platforms such as WeChat, Baidu, and Alipay. See, eMarketer; QuestMobile, "China Mobile Internet 2019 Half Year Report"; Aladdin, "2019 Mini-Programs White Papers," January 2, 2020.

9 Since the launch of the App Store, Apple's policy has been to not charge a commission on sales of physical goods and services or advertising.

10 The sales associated with purchases made on mobile browser apps are excluded.

using information collected from marketing surveys or data on usage patterns.[xxiii] Finally, we apportion usage to Apple platforms based on the overall iOS share market share.[11,xxiv]

Digital payments

Digital payment apps have become increasingly popular worldwide, although the landscape differs substantially across countries. In China, currently the largest market for digital payments, two QR code-based payment apps, Alipay and WeChat Pay, dominate both online and brick-and-mortar points of sales. These apps charge merchants a fee on purchases paid for with their apps. In the US, app-based payment systems are a relatively nascent market[xxv] while peer-to-peer transfer apps such as Venmo and Cash App are already popular and have grown significantly in recent years.[xxvi] In this year's study, we also consider India's growing digital payment market driven by PhonePe; however, they remain significantly smaller than the US and China.

We estimate the transaction fees collected by developers from customers or merchants for payments and transfers occurring through apps on the iOS platform.[12] For QR code-based payment apps in China, we start with an estimate of total payment volume (TPV) from a third-party research firm.[xxvii] We then estimate WeChat Pay and Alipay total transaction fees using their published fee rates and deductible policies. For peer-to-peer transfer apps in the US, we use the ratio of total transaction fees to TPV from Venmo and Cash App to estimate the transaction fees collected by the apps. For digital payment apps in India, we start with a third-party estimate of total transaction value of digital payments,[xxviii] as well as PhonePe's revenue and market share to back-out the total fees and average fee rate generated from digital payments. Finally, we apportion usage to Apple platforms based on data on the overall iOS share in each region.[xxix]

In-app advertising

In-app advertising is a frequently used and effective method of monetizing apps whereby developers publish advertisements within their apps. Prominent examples of apps that primarily make money through in-app advertising are Instagram, Twitter, YouTube, and Pinterest, and Sina Weibo in China. Examples of games are Rolly Vortex and Helix Jump. These apps tend to be free to download and use, but in-app advertising can also be a complementary monetization strategy for paid apps or apps with in-app purchases.

Users have been spending more and more time on their mobile devices, particularly using apps, which has led to an increased share of digital marketing expenditures going toward in-app advertising. Given that apps are used frequently throughout the day – for example, during commutes or moments of downtime – in-app advertising allows advertisers to reach users in ways that other marketing channels cannot. Compared with mobile web,

11 Apportioning by iOS market share almost certainly results in a conservative estimate because owners of iOS devices tend to spend relatively more than owners of Android devices. See, e.g., Comscore.

12 Our study excludes digital payment apps and services based on near-field communication, such as Apple Pay. Mobile commerce transactions that occur within an app and are paid with Apple Pay are included in m-commerce sales.

the app environment is a more effective way for advertisers to reach their audiences, with in-app advertisements allowing for personalized and contextually relevant ad messages.

Technology research firm Omdia estimated that in-app ad sales for iOS apps were $109 billion in 2022, with almost $27 billion (25%) tied to gaming apps.[xxx] This estimate includes revenue generated from the publishing of advertisements within apps only, and excludes advertising on mobile web (including mobile browser apps), search advertising, and Apple Search Ads. Omdia derived this estimate based on ad sales reported by large digital advertising firms, and then used data analytics from mobile ad platforms to apportion the iOS share, limited to in-app advertising only (i.e., by removing mobile web advertising), and to adjust for ad price differences between the iOS and Android app platforms. We use Omdia's research in this study. In 2021, Omdia considerably remodeled their historical estimates to account for the display advertising market. In all years, we use Omdia's retroactively updated estimates.

Additional dimensions not included in our estimates

The App Store has also made it easier and more secure for consumers to sign up for subscriptions and make purchases of digital goods and services. This may lead to incremental sales for app developers regardless of the platform chosen by users to consume the digital goods and services. Apps have also allowed traditional firms and industries to expand their offerings of a wide range of products via connected devices – devices that typically require the use of apps to control and monitor them. The App Store has enabled a new generation of home devices like smart thermostats and doorbells, for example, as well as new possibilities for health like connected blood pressure cuffs, smart scales, and even hearing aids.

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Analysis Group is one of the largest international economics consulting firms, with more than 1,200 professionals across 14 offices in North America, Europe, and Asia. Since 1981, Analysis Group has provided expertise in economics, finance, health care analytics, and strategy to top law firms, Fortune Global 500 companies, and government agencies worldwide.

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