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Comments of

ACT | The App Association

to the

United Kingdom's Competition and Markets
Authority

on the

Statement of scope for a market study into
mobile ecosystems

ACT | The App Association's response to the Competition and Markets Authority's invitation to comment on the statement of scope for the "Mobile ecosystems market study"

I. Introduction and statement of interest

ACT | The App Association (hereafter 'App Association') hereby responds to the Competition and Markets Authority (CMA) invitation to comment on the statement of scope for the 'Mobile ecosystems market study'. The App Association welcomes the CMA's interest in mobile ecosystems and supports its efforts to maintain the United Kingdom's fair and competitive digital economy.

The App Association is a not-for-profit trade association located in Brussels, Belgium, that represents more than 5,000 small and medium-sized application developers and connected device companies located across the United Kingdom of Great Britain and Northern Ireland (UK), the European Union (EU), and around the globe. We commit to creating an economic environment that fosters innovation and supporting competition between and growth for all participants in digital markets. Today, the value of the ecosystem the App Association represents—which we call the app economy—is approximately £716 billion globally and is responsible for over 330,000 UK jobs.¹ Alongside the world's rapid embrace of mobile technology, our members develop innovative hardware and software solutions that power the growth of the internet of things (IoT) across modalities and segments of the economy. The App Association's members include many UK-based innovators who develop mobile technology products in both established and emerging markets. For our members, the existing cooperation between developers and platforms represents a symbiotic relationship. Maintaining the level-playing field between big and small-sized developers helps to ensure a healthy, competitive, and innovation-friendly ecosystem. We, therefore, appreciate that the CMA is monitoring competition problems in this market.

Considering the dynamic characteristics of the business models of both platforms and our members, it is vital that future competition policy allows new technologies to develop in a flexible and reliable digital environment. Policy actions must ensure strong competition while considering the possibility of unintended market distortions. As the CMA states, the outcome of this market study could be enforcement action using its consumer or competition powers. Therefore, the App Association believes it is of crucial importance to provide the viewpoints of our members on the scope of this study to ensure that the information used to assess whether providers of mobile ecosystems is complete and includes all stakeholders.

II. The statement of scope for the mobile ecosystems market study

Like the CMA, the App Association believes that mobile devices have become fundamental to the daily lives of UK citizens, allowing users to access news, music, video streaming, health data, finances, games, shopping, and more. Mobile devices with internet connectivity, including smartphones, tablets, smart speakers, watches, home security, and lighting, are part of what we consider the mobile ecosystem. Mobile applications and operating systems (OS) are also part of

¹ https://www.progressivepolicy.org/wp-content/uploads/2017/10/PPI_EuropeAppEconomy_2017_.pdf.

this mobile ecosystem. Therefore, we encourage the CMA to revisit its conclusion that consumers face a choice between a duopoly of mobile ecosystems.

The CMA considers mobile devices, mobile OS, and mobile applications all as core sets of products of mobile ecosystems. There are many more than two providers of smart speakers, security systems, and wearables, and they use several operating systems, marketplaces for apps, and programming interfaces. In addition to iOS and Android, there are many OS choices such as Alexa OS, EcoBee, and Fitbit OS. We encourage the CMA to reflect this reality in its depiction of the mobile ecosystem.

While we could not agree more with the CMA that the app stores are an important gateway for developers to access consumers, we want to point out that app developers have a choice of platforms on which they can develop. Most apps are available on multiple platforms, such as the web and other mobile devices, and voice assistants. For our members and many small app businesses, consumer trust is an essential component of success in the app ecosystem and a key factor developers consider when choosing a platform for their product. The app stores' rigorous review processes have helped to protect their users from harm and thereby create consumer trust. The app curation process provides consumers with the assurance that it is safe to download apps from lesser-known companies without accidentally inviting a virus, malware, or illegal content onto their device. This trust is especially fundamental to the survival of small app developers or new market entrants that do not yet enjoy the broad recognition of larger brands.

Regarding the CMA's mention of concerns expressed by game developers and music streaming service providers, we note that these complaints have stemmed largely from well-established companies with global brands. We encourage the CMA to consider the differences between small developers and these global companies. These larger developers may no longer need the wide access and range of services that software distribution platforms provide, which enabled these companies to grow to their current level. Now they seem to want to change the system for their benefit, denying up-and-coming players the advantages they enjoyed. CMA should be especially wary of populist calls for the overapplication of antitrust law to digital platform activity in the developer side of the market, as a small group of larger developers continue to seek to use the antitrust laws to punish their competitors and overstate the problems they identify. For example, advocates for antitrust intervention point to the cost of the services software platforms provide to developers as evidence that policymakers should expand antitrust law, comparing the cost of software distribution to the cost of payment processing. However, payment processing is just one element of the array of services available to developers on a software platform, which include: immediate availability through hundreds of millions of people's devices; marketing through the app store; privacy features embedded in the platform; assistance with intellectual property protection; and security features built into the platform. There is an overstatement of the costs of developer services paid to platforms in these complaints. The comparison of such costs to a much less substantial service does not warrant an expansion of antitrust law or the creation of a new regulatory regime to reduce the price of developer services.

Overall, we would like to highlight the symbiotic relationship between software platforms, developers, and users and invite the CMA to consider this relationship in its investigation. Increased platform traffic attracts more developers, which brings in more consumers who then benefit from a higher quantity of high-quality apps. For small and medium-sized enterprises (SMEs) and start-ups, the network effects of this multi-sided market are particularly beneficial. They allow

small developers to reach new consumers instantly across borders. To attract more developers, the platforms' investment in programming and advertising integration tools, ready-to-use payment, and billing services are particularly advantageous for the smallest app developers who would not otherwise have the resources to develop such features. The more attractive these offerings are, the more app developers flock to platforms. Just like developers compete on platforms, software distribution services compete for developers and users. The stores try to differentiate themselves through various features such as prices, privacy, security, design, battery life, and others. Today, the largest software platforms show intense competition between app developers and between each other. No matter their size, they all have access to the same built-in benefits and compete under the same terms and conditions. We urge the CMA to consider these dynamics, including the competition and level playing field for developers, the low switching costs for users, and the opportunities this creates for smaller developers.

Innovative apps make these devices more valuable and useful for their customers – without them, a smartphone is simply a phone. Platforms themselves have the incentive to offer a wide variety of high-quality apps in their stores to attract more customers, which benefits consumers who have easy access to vetted, high-quality apps. Consumers also significantly benefit from the trustworthiness, privacy protections, an update system for their mobile apps, as well as the convenience of centralised payments and refunds. For app developers, platforms significantly decreased entry barriers by providing development frameworks and testing tools, facilitating consumer access, providing payment infrastructure, and more. Due to easier market access and lower overhead costs for developers, innovation and competition flourished. This effective combination of competition allows end-users to enjoy the optimal price-quality combination that matches their personal preferences. Considering the beneficial effects platforms have for small developers, we strongly encourage the CMA to holistically investigate these aspects in addition to potentially negative features.

a. Context for the market study

The App Association welcomes the CMA's establishment of a Digital Markets Unit in the context of its ongoing investigation into online platforms. Concerning the 'strategic market status' (SMS) concept, we emphasise that SMS in itself should not be the sole criterion for intervention. Traditionally, competition law prohibits the abuse of a dominant position, not the existence of the dominant position, and the scope of the CMA's approach should reflect this. More specifically, concerning the upcoming study of mobile ecosystems, the CMA's language indicates that the study will contribute to the establishment of a new pro-competition regulatory regime. We urge the CMA to first determine whether a monopoly position exists, and then, if so, whether there is an abuse of such monopoly leading to the detriment of consumers and the public interest, before undertaking action. The app economy had tremendous success over the past decade and is quick to adapt and resolve problems based on competition driven by consumer demands.

In the context of the CMA's investigation into the Apple App Store's terms and conditions, it is worth highlighting that all developers compete under the same terms and conditions, bringing smaller developers on a level playing field with larger competitors. To our members and other small developers, these terms and conditions are essential in providing quality, security, and a better user experience. Without terms that protect the user experience, consumer welfare would decrease due to lower quality apps and security risks. Smaller app makers (as lesser-known brands) would particularly suffer from the lack of consumer trust in their products. The role of the

platforms' terms and conditions in preserving consumer confidence is crucial for our SME member companies. Further, it is important to consider that the terms and conditions are regularly updated in response to market changes. We believe these are important aspects that the CMA should consider for the context of this study.

We welcome the CMA's commitment to draw on work carried out in other jurisdictions, in particular the studies produced by the European Commission's Platform Observatory in 2020.² Additionally, the App Association agrees with the CMA that an increasing regulatory alignment between the largest digital economies will deliver efficiencies for the businesses affected and may boost incentives for cooperation and compliance by the largest firms. We, therefore, encourage the CMA to take an internationally coherent approach in the context of all ongoing investigations and legislative developments.

b. Scope of the study

The App Association welcomes the CMA's intention to adopt a broad focus on competition throughout the mobile ecosystem. Given that the CMA's definition of mobile ecosystems includes wearables, smart devices, and operating systems, the scope of the study appears somewhat narrow, especially considering that platforms are not the main source of revenue for Google or Apple. Studying mobile ecosystems should go beyond examining the business models of Apple and Google to avoid misrepresenting the large number of choices that exist. Therefore, we encourage the CMA to adopt a wider focus for the study to ensure it's useful in the long-term perspective and beneficial for future policy recommendations.

We invite the CMA to consider the points we make in this filing to ensure that the themes of the study represent the realities of the app economy, and we believe CMA's focus on Apple and Google only is inappropriate given the goals of CMA. Nevertheless, should CMA proceed with its study scope as proposed, we offer the following input on proposed Themes:

- Theme 1 will investigate Apple and Google's role in barriers to entry, network effects and economies of scale, as well as consumer lock-in. In addition to these aspects, we strongly encourage the CMA to also study the numerous barriers to entry that the platforms remove, such as access to a global market, instant consumer trust, the ability to protect intellectual property, and significant reduction of overhead costs. As we highlighted earlier, SMEs and start-ups in particular benefit from the network effects of this multi-sided market. Network effects and multi-sidedness are the key characteristics of platforms. Conducting this study with a multi-sided scope will produce a more complete result. Regarding consumer lock-in and switching costs, we encourage the CMA to consider that most apps are available on multiple platforms. The majority of our members develops their apps at least for two to three different platforms. Even apps created by platform companies are available for multiple operating systems. For example, Apple Music is available on Android, just like Gmail or Google Calendar are available on iOS. The cross-platform availability of apps also increasingly reduced switching costs between iOS and Android for users over the years.
- Theme 2 will examine the extent to which Google and Apple have market power in the distribution of mobile apps, including the extent to which there are 'suitable' alternatives. We encourage the CMA to define more clearly what constitutes a 'suitable' alternative or

² <https://digital-strategy.ec.europa.eu/en/policies/eu-observatory-online-platform-economy>.

who will eventually determine what ‘suitable’ means. As explained above, platforms have a much greater incentive to keep their services attractive for developers and consumers, rather than exploiting them. The CMA should examine these incentives, as platforms want to offer as many safe, high-quality app choices as possible to consumers. On the developer side, the platforms want to offer the best tools to make the apps that make the mobile device more useful. Digital markets are often multi-sided markets and characterised by the presence of network effects. The utility users on one side of the market derive from their participation in the platform depends on the number of participants on the other side of the market. In the app economy context, this means both app developers and mobile app users benefit from this market structure. We, thus, strongly urge the CMA to consider the multi-sidedness of the app distribution market in its investigation into mobile ecosystems.

- Theme 3 will look into the competition in the supply of mobile browsers and browser engines. We encourage the CMA to release more details about this theme to determine whether it warrants an investigation and resources from the CMA. Ultimately, if there is significant anti-competitive behaviour in the supply of mobile browsers and browser engines, we welcome the CMA’s examination of the issue. Generally, considering the role of pre-installation and default settings, we point out that consumers reasonably expect phones to come with default settings and pre-installed apps. Apple and Google both develop several apps not pre-installed on devices, but available for download from platforms. It is now easier to uninstall pre-installed apps and change default settings.
- Theme 4 will investigate how Apple’s and Google’s conduct affects competition between developers, including the app review process. We encourage the CMA to examine the positive effects that platforms have on competition by allowing developers to access a global market and reducing their overhead costs. We also invite the CMA to expand its investigation beyond the cases in which the app review process failed to prevent the distribution of apps that may cause consumer harm. A full investigation could benefit from considering all instances in which the platform review processes prevent harm as well.

We believe the scope of the study could benefit most from including the following points: the competition between developers and between platforms for developers and consumers, the barriers platforms remove to lower switching costs for users and overhead costs for developers, the level-playing field dynamics for developers, and the opportunities this creates for smaller developers.

c. Potential outcomes and remedies

Given that the findings of this market study may inform SMS designations by the Digital Markets Unit, and by extension, codes of conduct, we strongly urge the CMA to take a balanced and inclusive approach to this study. The potential remedies seem to assume the outcome of the study, namely that there is an OS and platform ‘duopoly’ of which Apple and Google take advantage so they can provide lower quality services and charge higher prices. Any presumption of such an outcome is detrimental to CMA’s efforts to accurately evaluate software distribution platforms, and undercuts the effectiveness of its investigation, outcomes of that investigation, and any actions taken pursuant to findings from the investigation. We encourage the CMA to use this study to examine whether there is real competition between the wide diversity of platforms available to consumers and developers, and should it identify a monopoly position, if one or more

display anti-competitive behaviours. Specifically, the three categories for intervention indicate that the CMA is proposing ‘solutions’ before identifying the problem. In a system as complex as the app ecosystem, such an approach is very risky and suggests a possible unbalance in the results of the study.

d. Evidence-gathering

For evidence gathering, we are attaching an App Association study conducted by Deloitte on the App Economy in Europe in 2020, as well as a timeline of competition between the platforms. We also encourage the CMA to issue information and meeting requests to a broad range of stakeholders, including, in particular, small and micro-enterprises.

III. Conclusion

The App Association thanks the CMA for consideration of our comments. We welcome the CMA’s interest in mobile ecosystems and support its efforts to maintain the UK’s fair and competitive digital economy. Based on this statement of scope, we believe the study of mobile ecosystems should examine the positive as well as the negative aspects of the platform ecosystem to be fully inclusive and arrive at an unbiased result. Only examining the potentially negative aspects risks ignoring the reasons why the current system has created so much value, innovation, and competition. Additionally, we encourage the CMA to examine in detail how the platforms fiercely compete with each other and how the CMA can continue to foster those dynamics. A positive approach to this study and future regulation that encourages natural competition and leverages productive incentives would boost the digital economy and innovation.

We share the ambition of the CMA to preserve competitive digital markets and support the effort to identify specific market failures and assess structural issues in detail before determining policy recommendations. This path of action will help to avoid unintended consequences that would negatively impact SMEs. In the context of a new pro-competitive framework, an evidence-based, fair, and coherent regulatory approach is essential to guarantee that small businesses have a strong voice in the UK’s digital economy. The App Association remains at the CMA’s disposal to provide further input or information for this study. We thank the CMA in advance for its consideration of our submission, and we look forward to engaging further in the future.

IV. Annex

Annex I: [“The App Economy in the European Union: A review of the mobile app market and its contribution to the European Economy”](#). By Deloitte Finance

Annex II: [“A Brief History of Time: The App Stores”](#). By ACT | The App Association

PDF versions are attached to our email response.

A Brief History of Time: The App Stores



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A Brief History of Time: The App Stores

Introduction:

Since its inception, the app ecosystem has grown exponentially alongside the rise of the smartphone and other smart technologies. The app economy is driven by app developers and innovators who rely on platforms like Apple's App Store and the Google Play store to reach consumers around the globe. On the other hand, the app stores depend on developers to put innovative products on their platforms to attract customers.

App stores, in their brief history, revolutionised software distribution and the economy at large and established a symbiotic relationship between software developers and platforms. And in the years since the app stores went online, both developers and platform companies contributed to the overall success of the app economy. Although it is a brief history in the grand scheme of things, the speed, level of innovation, and constant change in the app stores are remarkable. The chart below documents how the two largest app stores evolved, innovated and interacted with each other since their inception.

2008:

	iOS/Apple	Android/Google
July	💡 The Apple App Store goes live with 500 applications and tabs, including "Featured," "Categories," "Top 25" (paid and free), "Search," and "updates." ¹ Of these apps, 25 per cent are free.	
September	Apple hits 100,000,000 downloads and 3,000 apps. ²	
October		💡 Google releases Android 1.0 and the Android Market. ³ Right away, 50 free applications are available. ⁴

2009:

	iOS/Apple	Android/Google
February		Google introduces support for paid applications in the United States and the United Kingdom. ⁵
March		2,300 apps are available on Android Market. ⁶
April	Apple hit 35,000 available apps and 1 billion downloads total over 77 countries. ⁷	💡 Google released Android 1.5 (Cupcake), introducing support for widgets on the home screen. ⁸
June	💡 Apple releases iOS 3, introducing in-app purchases for paid apps only. The native app SDK now includes 1,000 new APIs. ⁹ Apple introduces subscriptions for publications.	

July	App Store features 65,000 available apps from 100,000 developers and reaches 1.5 billion downloads total. ¹⁰	
September	<p>Apple hits 85,000 apps available by 125,000 developers and 2 billion total downloads.¹¹</p> <p>Apple introduces Genius recommendations and allows gift card balances and iTunes score credit as payment.¹²</p>	<p>With the introduction of Android 1.6, Android Market allows users to choose among “Apps,” “Games,” and “Downloads.” Within categories, users can sort apps by “Top paid,” “Top free,” and “Just in.”</p> <p>Developers can submit screenshots of their apps to Android Market and can now include their content in Android’s Quick Search Box results.</p> <p>This Android update features multi-lingual speech synthesis, allowing apps to “speak” strings of text.¹³</p>
October	💡 Apple expands in-app purchases to free apps. ¹⁴	
December		Android Market reaches 16,000 available applications. ¹⁵

2010:

	iOS/Apple	Android/Google
January	Apple’s App Store hits 3 billion downloads. ¹⁶	
May		The public release of Android 2.2. (Froyo) improves app speed and launch, enables push notifications and updates Android Market with batch and automatic update features. ¹⁷
June	<p>The iPad App Store reaches 10,000 available apps.¹⁸</p> <p>Apple releases iOS 4, which includes “multitasking” that lets apps run in the background, iBooks, and Game Center.¹⁹</p> <p>Apple announces \$1 billion total revenue paid out to developers to date.²⁰</p>	
July	Apple releases iAd, which lets developers use ads managed by Apple in their applications (retired in 2016). ²¹	Android Market reaches 70,000 apps available. ²²
September	💡 Apple publishes the official App Store Review Guidelines for developers. ²³	Google expands support for paid apps to 29 more countries. ²⁴ Android Market reaches 80,000 available apps. ²⁵

December		<p>Google raises the allowed app size from 25 to 50 MB and adds a feature graphic for every app.²⁶</p> <p>Google releases Android 2.3 (Gingerbread) with enhanced audio, graphical, and developer input for games. Gingerbread supports video playback, improves support for native code development, and supports SIP VoIP internet phones.²⁷</p> <p>Android Market adds content filtering features.²⁸</p>
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2011:

	iOS/Apple	Android/Google
January	The App Store hits 10 billion downloads. ²⁹	
February	💡 The App Store starts supporting subscriptions for all publishers of content-based apps. ³⁰	<p>Google introduces the Android Market Webstore.³¹</p> <p>Google releases the first tablet-only update of Android (Honeycomb/Android 3.0).³²</p>
March		Google introduces its in-app purchasing system on Android Market.
April		Android Market reaches 3 billion downloads. ³³
May		Google adds new application lists to Android Market: "Top Paid," "Top Free," "Editor's Choice," "Top Grossing," "Top Developers," and "Trending." ³⁴
July	The App Store reaches 425,000 apps available, 100,000 native iPad apps, and 15 billion downloads total. ³⁵	Google introduces an Android Market interface with a focus on featured content, more search features, book sales, and movie rentals. ³⁶
October	Apple releases iOS 5, introducing updates and support for iCloud, native Twitter sharing, the Notification Centre, Siri, iMessage, and push notifications for developers of Newsstand apps. ³⁷	Google releases Android 4.0 (Ice Cream Sandwich). It introduces the ability to access apps from the lock screen and shutting down apps with a swipe from the recent apps list, as well as new APIs for developers including resizable widgets. ³⁸
December		Android Market reaches 10 billion downloads. ³⁹

2012:

	iOS/Apple	Android/Google
February		Google introduces a new automated antivirus system, Google Bouncer, to scan both new and existing apps for malware (e.g., spyware or trojan horses). ⁴⁰
March	The App Store reaches 550,000 apps available and 25 billion downloads total. ⁴¹	Android Market, Google Music, and the eBook store become Google Play. ⁴² The allowed app size increases to include two expansion files with max. 2GB. ⁴³
May	💡 Apple introduces the “Free App of the Week” and Editor’s Choice promotions. ⁴⁴	Google rolls out carrier-billing for purchases ⁴⁵ and introduces subscriptions. ⁴⁶
June	Apple reaches 30 billion downloads and announces \$5 billion paid out to developers to date. ⁴⁷ The App Store search ranking algorithm changes to include user reviews and keywords in the app’s name. ⁴⁸	Google allows top developers to respond to user reviews. ⁴⁹ The new Android 4.1 (Jellybean) enhances accessibility and introduces expandable notifications and the ability to turn off notifications from apps. ⁵⁰ Google Play reaches 20 billion downloads and 600,000 apps available. ⁵¹
August		Google Play rolls out gift cards. ⁵² Google decouples certain aspects of the Android operating system so they can update through the Google Play store independent of the operating system. ⁵³ Google Play implements stricter rules for app titles and icons, payments, privacy, ads, and spam. ⁵⁴
September	iOS 6 introduces new information domains for Siri, Passbook (wallet), improvements across iOS’ bundled apps, and Apple Maps. ⁵⁵ The new App Store makes app pages more vibrant and includes a share button to make it easy to tell a friend about an app. Apple adds smart app banners to make it easier for developers to promote their apps in iOS 6. These banners let a user quickly jump into the App Store from a developer’s website. ⁵⁶	

October		Google revamps the Play Developers Console with an update to the publishing process, the ability to publish apps in 49 languages and to auto-translate into different languages. ⁵⁷
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2013:

	iOS/Apple	Android/Google
March	Apple informs developers they can use “appstore.com” for links to their apps. ⁵⁸	Google begins pulling ad-blocking apps from Google Play. ⁵⁹
April	The App Store reaches 45 billion downloads, and Apple announces \$9 billion paid out in revenue to developers to this date. ⁶⁰	
July		<p>One million apps are now available on Google Play and it reaches 50 billion downloads.⁶¹</p> <p>With Android 4.3, Google introduces Google Play Games.⁶² The update additionally introduces developer logging and analysing enhancements, support for five more languages, digital rights management (DRM) APIs, addition of “app ops,” support for geo-fencing, and Wi-Fi scanning APIs.⁶³</p>
August	The App Store algorithm changes to consider ratings, app updates, and user engagement in search rankings. ⁶⁴	
September	<p>iOS 7 re-introduces the vertical lists on the App Store, removes Genius and replaces it with a “Near Me” tab. iOS 7 adds a section just for kids’ apps on the App Store and introduces the automatic installation of app updates. This iOS update also includes a new multitasking system that allows all apps to run in the background.</p> <p>iOS 7 introduces the Control Centre, CarPlay, and Air-Drop.⁶⁵</p>	Google releases Android 4.4. (KitKat). It introduces the ability for applications to trigger translucency in the navigation and status bar, and the ability for applications to use “immersive mode” to keep the navigation and status bars hidden while maintaining user interaction. KitKat also includes a public API for developing and managing text messaging clients and a “Storage Access Framework,” an API allowing apps to retrieve files in a consistent manner. ⁶⁶
November		Google introduces Newsstand, combining Google Play Magazines and Google Currents. ⁶⁷

2014:

	iOS/Apple	Android/Google
June	The App Store reaches 1.2 million apps available and 75 billion downloads. ⁶⁸	
May		The Google Play store introduces PayPal payment support. ⁶⁹
July		<p>Google Play adds Books/Movies sections. Additionally, it launches a new information screen offering a list featuring the latest available version of an app, its installed size and content rating. This list also simplified the app permissions prompt into overview categories.⁷⁰</p> <p>Google announces Android KitKat for Android Wear devices (smartwatches) at Google I/O 2014.</p>
September	Apple releases iOS 8 in which it added support for app bundles, screenshots, and previews (which gave developers more ways to reach their audience), and a list of trending search terms on the search page. A new “explore” replaces the “near me” section. Apps can now become features available in other apps, which means users can perform actions with interactive notifications, quickly view content in widgets, and move content between apps with the share sheet. iOS 8 also introduces iCloud Family Sharing. ⁷¹	All developers on Google Play are now required to feature a physical address on the app’s page in Google Play.
November		Android 5.0 (Lollipop) features a redesigned user interface and improvements to notifications that could be accessed from the lock screen and displayed within applications as banners. Google adds support for 15 more languages. While the lock screen does not support widgets anymore, it now provides shortcuts to apps and notifications. ⁷²

2015:

	iOS/Apple	Android/Google
March		<p>💡 Google launches “Google Store,” replacing the devices section in Google Play.⁷³</p> <p>Google begins using a combination of automated tools and human reviewers to check apps for malware and terms of service violations before publishing in Google Play.⁷⁴</p> <p>At the same time, it begins rolling out a new age-based rating system for apps and games, based on a given region’s official ratings authority.⁷⁵</p>
May		<p>Google Play introduces A/B test experiments for developers.⁷⁶ It also launches content ratings, and age and interest filters.⁷⁷</p>
July	<p>The App Store reaches 1.5 million apps available and 100 billion downloads total.⁷⁸</p>	<p>Google AdWords goes live on Google Play and ads appear on Google Play, Search, YouTube, and the Google Display network.⁷⁹</p>
September	<p>Apple releases iOS 9, bringing a new multitasking paradigm to iPad, and launching Apple News, a new Notes app, and Apple Music. iOS 9 allows developers to expose app content to the search function.⁸⁰ (Google did this in September 2009)</p>	
October		<p>Google introduces Android 6.0 (Marshmallow). It includes contextual search from keywords within apps, an app standby feature, an app search bar and favourites, fingerprint reader support, app linking, 4k display mode for apps, support for actions by third-party apps in the text selection menu, and performance reports on Google Play Developer console.⁸¹ A Google Play redesign now organises content information into sections and introduces “highlights”.⁸²</p>
November	<p>Apple introduces a new “Shopping” app category,⁸³ and changes the algorithm so that search rankings become a mix of contextual app keywords, including partial keyword matches.⁸⁴</p>	

2016:

	iOS/Apple	Android/Google
April		Google Play starts labelling apps that contain ads. ⁸⁵ Google announces the Google Play Awards. ⁸⁶ transparency
May		💡 Google Play introduces new beta testing, analytics, and pre-launch tools for developers. ⁸⁷ Google introduces in-app subscriptions. ⁸⁸
June	<p>Apple announces the shutdown of the iAd platform.⁸⁹</p> <p>The App store reaches 2 million apps available, 130 billion downloads, and Apple announces \$50 billion paid out to developers to this date.⁹⁰</p> <p>The App Store's subscription model changes from the established 70/30 revenue split between developers and Apple to a new 85/15 revenue split if a user stays subscribed to the developer's app for a year. The policy change also opens the possibility of subscriptions to all apps, not just to select categories.⁹¹</p>	💡 Following Apple's announcement of a change in the subscription model, Google Play reportedly also announces an 85/15 revenue split. However, this change applies immediately not after one year of a subscription, like Apple's. ⁹²
July		Google Play introduces new app categories including "Dating," "Parenting," "Auto," and more. ⁹³
September	<p>Apple releases iOS 10. iMessage now includes apps, for which Apple models a new app store after the watchOS app store (introduced in 2015).⁹⁴</p> <p>"Categories" returns to the App Store layout. iOS 10 also includes Siri App Suggestions, a feature that surfaces apps iOS assumed users may want at a specific time or a specific location.⁹⁵</p> <p>Apple introduces App Store Search Ads. Developers can run ads against keywords and insert them at the top of search results. The App Store expands subscription support to all 25 of its categories.</p>	<p>Google Play, including all Android apps, come to Chrome OS.</p> <p>Android 7.0 (Nougat) introduces support for file-based encryption, the ability to display colour calibration, zoom in the screen, a VR interface, a new data save mode, and a new JIT compiler.</p>

October	Apple Search Ads goes live. Apple rolls out the ability for developers to purchase advertising spots in the App Store to business users in the United States. ⁹⁶	<p>Google Play begins monitoring fraudulent methods like fake installs, fake reviews, and incentivised ratings through a new detection and filtering system.⁹⁷</p> <p>Android 7.1. introduces support for circular app icons, keyboard image insertion, a fingerprint sensor gesture to open/close apps, a manual storage manager intent for apps, improved VR thread scheduling and app short-cuts, which launch actions on apps by long-pressing the app icon.⁹⁸</p>
November	Apple removes 50,000 outdated and abandoned apps from the App Store. ⁹⁹	

2017:

	iOS/Apple	Android/Google
February		<p>The Google Play Store algorithm changes so that search rankings now consider engagement.¹⁰⁰</p> <p>Google announces that it will let developers set sales for their apps with the original price struck out and a banner underneath informing users when the sale ends.¹⁰¹</p>
March	Apple allows developers to respond to app store reviews. ¹⁰² (Google did this in 2012).	<p>💡 Google Play adds a “Free App of the Week” section (Apple did this in 2012).¹⁰³</p> <p>Google releases lists of the best-selling apps, games, movies, music, and books over the past five years.¹⁰⁴</p>
May	Apple expands its search ads to the United Kingdom, Australia and New Zealand, along with more configurable advertising settings for developers. ¹⁰⁵	<p>Google Play Console gets new features. Google introduces Android vitals with app data before and after an app launch and Google Play Ads appear on the homepage and app listing pages.¹⁰⁶</p> <p>Google rebrands the Bouncer feature and other safety measures within the Android platform under the umbrella name Google Play Protect, a system that regularly scans apps for threats.¹⁰⁷</p>

<p>July</p>	<p>Apple announces over \$70 billion in App Store-generated revenue for developers since its 2008 launch.¹⁰⁸</p>	<p>Google Play expands the “Editors’ Choice” section and introduces “Android Excellence” collections with editorial content.¹⁰⁹</p> <p>Google launches a new security effort called “peer grouping,” which groups together apps that perform similar functionalities, such as calculator apps, and compares their attributes.¹¹⁰</p>
<p>September</p>	<p>Apple releases iOS 11. It limits app names from 50 to 30 characters, adds new fields, subtitles, and promos for apps, and increases visibility for ratings, reviews, top charts, rankings, editorial content, daily featured apps, and games. The all-new App Store has five sections, including “Today”, a collection of stories and features updated every day, “Games”, “Apps”, “Updates” and “Search” sections.¹¹¹</p> <p>iOS 11 also improves Siri and introduces the AR-Kit 1.0. Overnight iOS becomes the biggest AR platform in the world.¹¹²</p> <p>From iOS 11 on, developers can no longer use custom prompts for encouraging users to leave reviews for their apps per a change in the Review Guidelines.¹¹³</p> <p>Developers can now choose whether to keep current app reviews when updating their apps or to reset them.¹¹⁴ privacy</p>	
<p>October</p>	<p>Apple expands search ads to Canada, Mexico, and Switzerland.¹¹⁵</p>	<p>💡 Google launches “Play Instant” (also named Google Instant Apps), allowing the use of an app or game without installing it first.¹¹⁶ (This seems like the App Clips Apple launched in 2020.)</p>

December	<p>Apple updates its search ads program to offer two distinctive versions. “Search Ads Basic” is a pay-per-install program aimed at smaller developers, in which they only pay when users physically install their app.¹¹⁷</p> <p>Developers can now offer applications for pre-order, allowing them to make apps visible in the store between two and 90 days ahead of release.¹¹⁸</p> <p>The number of apps on the App Store shrinks for the first time in 2017 as Apple removes older apps that do not comply with current guidelines and technologies.¹¹⁹</p> <p>An update of the App Store guidelines allows Apple to ban apps using templates or commercial app services if the provider of the app’s content does not directly submit it.¹²⁰</p>	<p>Android 8 (Oreo) introduces a neural networks API and a shared memory API. It restricts apps’ background execution and limits, supports automatic light and dark themes and app-specific unknown sources, as well as improves notifications and adaptive icons.¹²¹</p>
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2018:

	iOS/Apple	Android/Google
January	<p>Apple waives the developer fee for governments and non-profits and educational organisations.¹²²</p>	<p>For any subscribers that developers retain after 12 paid months, the transaction fee for subscription products decreases to 15 per cent.¹²³</p> <p>Despite earlier reporting indicating otherwise,¹²⁴ Google started using the same model as Apple for in-app subscriptions on Google Play.¹²⁵</p>
August	<p>Apple retires the iTunes affiliate program.¹²⁶</p>	<p>Android 9 (Pie) introduces new transitions for switching between apps or activities within apps. It enables richer messaging notifications where a full conversation could be seen within a notification, full-scale images and smart replies. It also includes a redesigned multitask app switcher with the Google search bar and app drawer built-in, the Android Dashboard, which tells the user how much time they are spending on their device and in apps and allows the user to set time limits on apps.¹²⁷ (Apple introduces screen time and app limits with iOS 12.)</p>

September	<p>iOS 12 introduces the AR-Kit 2.0, Create ML, and prediction batching as well as grouped notification alerts for the same app and interactions on the lock screen. It also launches Siri shortcuts, which enable users to trigger actions in-app using Siri, and Health Records, which allows users to share clinical history with health apps. Developers can now share authentication logins between Safari and apps. Other new key security and privacy features include a built-in password manager, easy two-factor authentication, and a Password AutoFill API. CarPlay now functions with navigation apps. A new Natural Language framework enables on-device natural language processing and supports language recognition, tokenisation, and tagging. iOS 12 also introduces screen time and app limit features.¹²⁸</p>	
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2019:

	iOS/Apple	Android/Google
April		<p>💡 Google announces it will take several days to review app submissions from new and less-established developers.¹²⁹ Later Google clarifies that, in exceptional cases, certain apps may be subject to an expanded review process.¹³⁰</p>
September	<p>Apple releases iOS 13. It introduces tools for dark mode across iOS 13, including apps. Other tools include faster app launches and smaller app downloads/update sizes, the sign-in with Apple SSO option and a SwiftUI framework that lets developers build new innovative user interfaces. iPad apps can now be exported as macOS apps, and iOS 13 restricts the PushKit API for encryption/decryption to VoIP calls. The new “PencilKit” framework allows developers to integrate drawing environments for hand-drawn content, and the on-Device Speech Recognition enables developers to do offline transcriptions and speech analysis. A document scanning system becomes available to use in a new micro-framework called VisionKit, and custom app fonts are introduced.¹³¹ Siri can now play music from Spotify and other radio/podcast stations, and the AR-Kit 3.0 released.¹³²</p> <p>Apple also launches Apple Arcade (a subscription service for video games within the app store).¹³³</p>	<p>Google releases Android 10. Background apps can no longer jump into the foreground, and a floating settings panel now allows changing system settings directly from apps. Android 10 also includes new safeguards for user privacy, a native MIDI API allowing interaction with music controllers, and better support for biometric authentication in apps. Android 10 additionally improves support for notification bubbles and a system-wide dark theme/mode.¹³⁴</p> <p>Google launches its Google Play Pass games and apps subscription service in the United States.¹³⁵</p>

2020:

	iOS/Apple	Android/Google
January	As of 2020, the App Store features around 1.8 million apps, and Apple announces developer revenue increased to \$155 billion total since 2008. ¹³⁶	As of 2020, Google Play features around 2.7 million apps, ¹³⁷ and Google announces developer revenue increased to \$80 billion since 2008. ¹³⁸
April		Google Play introduces a new “Teacher Approved” category. ¹³⁹
September	iOS 14 launches App Clips (a lightweight version of an app offering some of this functionality, discoverable the moment it’s needed), widgets on the home screen in multiple sizes, customisations with interactive features, and content updates, the AR-Kit 4.0, and introduced the App Tracking Transparency Framework (developers have to ask users to agree to share their usage data and unique ad identifiers are no longer available), and family sharing for in-app purchases. ¹⁴⁰	Android 11 introduces chat bubbles, screen recording, notification history, an API distinction between stand-alone 5G and non-standalone 5G, and new permission controls. ¹⁴¹
December	Enrolment for the App Store Small Business program opens. ¹⁴² The program features a reduced commission rate of 15 per cent on paid apps and IAP for new developers and businesses who made up to \$1 million in proceeds in 2020 for all their apps. ¹⁴³ App privacy labels go live on the App Store. The labels are displayed on each app’s product page and allow users to learn about data types the app may collect and how that data is used. ¹⁴⁴	

2021:

	iOS/Apple	Android/Google
January	Apple announces \$200 billion total paid out to developers since the App Store launched in 2008. ¹⁴⁵	As of January 2021, Google Play features over 3 million apps ¹⁴⁶ . Google Play Store launches new icons to show trending apps. This feature lets developers, publishers and users see a new rank change icon in its top app lists. ¹⁴⁷
March		💡 Google announces it will lower its commission fees for in-app digital goods and services for developers around the world. Beginning in July 2021, the service fee for the first \$1 million of revenue will drop to 15%. Beyond the first \$1 million in revenue, Google will charge 30% for every dollar generated through the Play Store. ¹⁴⁸

Conclusion:

The remarkable evolution of the app economy happened in tandem with the development of app stores and smartphone operating systems. The by-now well-established, centralised platforms continue to innovate and thereby help to drive the app ecosystem's dynamic growth and unrivalled success. While the app stores serve as a foundation and database for apps, they also compete to be the most attractive for developers to expand the growing uses of apps across industries and enterprises and to attract more consumers onto their platforms. As this timeline has demonstrated, the app ecosystem is highly interconnected, and the app stores are an important part of it. They interact and respond to each other to remain competitive and attractive for developers.

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The App Economy in the European Union

A review of the mobile app market and its contribution to the European Economy

June 2020

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Executive summary

1. The introduction of smartphones reshaped the way Europeans interact in almost all areas of personal and professional life. Apps¹ developed by third-party companies are an essential part of the way mobile devices provide services. Depending on the service, apps may also run on other types of devices, such as connected televisions, game consoles, virtual reality headsets or PCs. This report focuses on the mobile channel. The purpose of this document is to analyse the benefits introduced by mobile apps and the quantification of the European Union's mobile app economy.
2. Our research demonstrates the positive impact of app stores²:
 - App stores have enabled disintermediation between buyers and developers which is one way through which app stores **reduce transaction costs** for app developers and their users.
 - App stores reduce entry barriers for developers and therefore increase the level of competition.
 - App stores increase consumer trust and security by creating a trustworthy platform for users and developers.
3. **The direct revenues of the app economy in the European Union³ amounted to €86 billion in 2019** – these are revenues for mobile app developers. In comparison, box office revenues in the EU stood at €6.8 billion in the same year, and revenues for the provision of sporting and recreation services⁴ was estimated at 145 billion.
4. Including direct and indirect contributions, the app economy generated **€187 billion in revenue throughout all sectors of the EU's economy**. The breakdown of this sum is as follows:
 - Direct contributions are estimated at €86 billion with the following categories:
 - i. Advertising revenue: €23.3 billion
 - ii. Paid downloads, subscriptions and in-app purchases: € 5.7 billion. Mobile games represented 67% of this revenue
 - iii. Contract work: €55.6 billion
 - iv. Mobile-commerce: €1.6 billion is attributable to the app sector (out of a total of €394 billion total revenue)
 - Indirect contribution: €101 billion in indirect contributions due to additional business and household consumption triggered by app development.

In terms of value added, the app economy represented 0.4% of the European Union's GDP in 2019.

¹ Apps refer to the software applications that run on smartphones.

² App stores refer to all app platforms including Google Play store, Apple App Store, Amazon app store, etc.

³ Throughout this document, figures are cited for EU28.

⁴ Source: Eurostat, Symmetric input-output table at basic prices. NACE R93, Sporting services and amusement and recreation services.

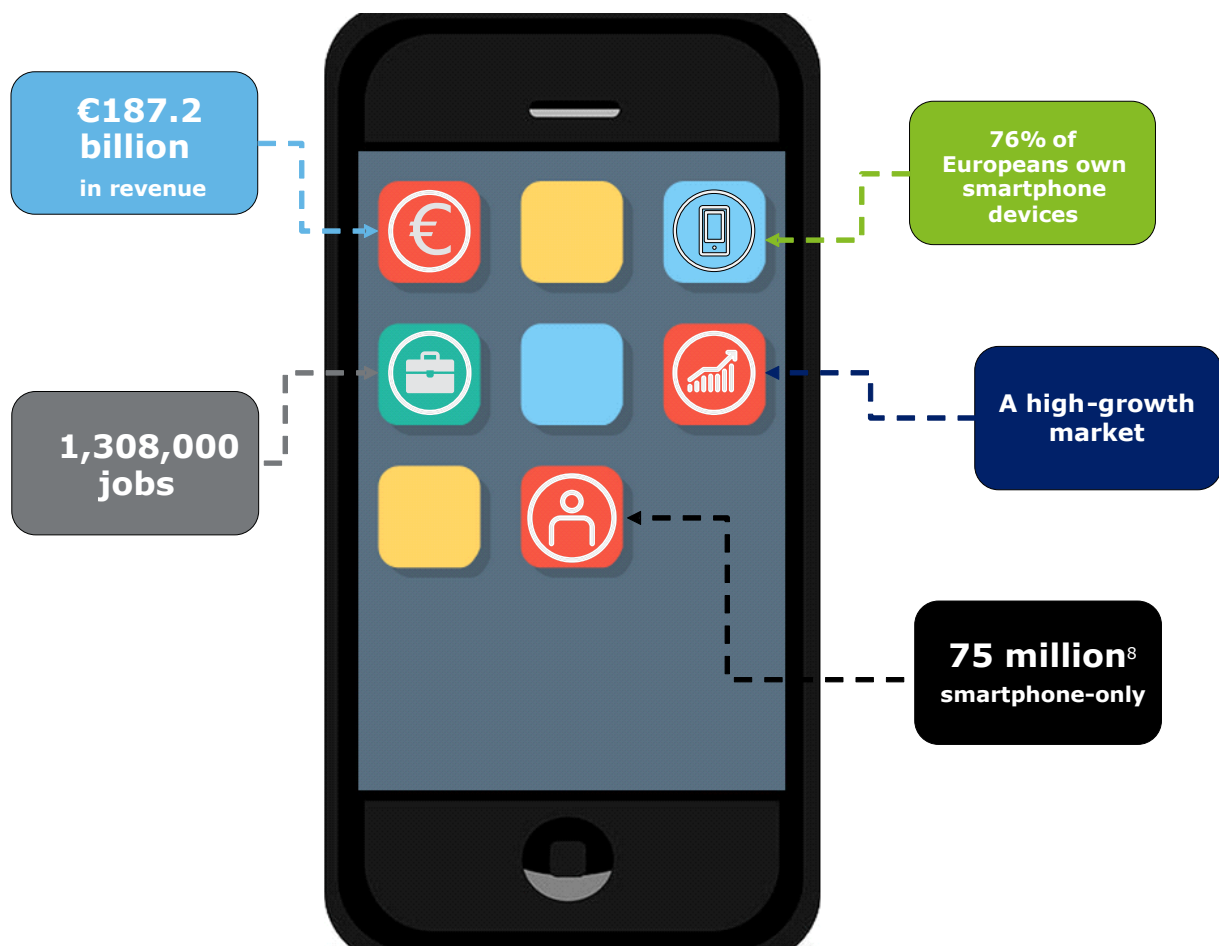
5. The total number of jobs generated throughout all sectors of the EU's economy by the app sector in 2019 is estimated between 1.3 million and 1.7 million. Both figures have been estimated by different methods. The lower figure is the Deloitte estimate. Jobs are calculated using our "Input-Output" framework (total revenue for the sector combined with national accounts data). The higher number is obtained by the Progressive Policy Institute, counting relevant job ads⁵. These figures include direct jobs (software developers, mobile app specialists), indirect jobs (suppliers to the app developers) and induced jobs (jobs created by the spending of the directly and indirectly employed workers).
6. The rapid growth of consumer spending on apps – Europeans spent 19% more on apps in 2019 than in the previous year– and the growth of the smartphone-only population shows that **apps increase consumer wellbeing**. The importance of M-commerce, which now accounts for almost half of e-commerce in the EU⁶, also attests to consumers' preference of for mobile services. When given the choice, many consumers opt for service provision via apps.
7. Looking at the producer side, we observe how **apps have permeated business models in several ways**: on the one hand many **firms incorporate apps into the way they provide services to their clients**. For example, airline and railways companies make the booking and travel process easier with mobile apps. Some of these apps go beyond offering a mobile distribution channel. Indeed, the specific features of mobile phones (geo-localization, accelerometer, camera, touch screen) have enabled the development of new services. For example, in the retail sector, Ikea Place uses augmented reality to allow the user to visualize furniture in his home before purchasing.
8. In addition, **pure players have appeared, companies that have built their activity on an app**. Well-known examples are ride-hailing apps, which use geo-localization and mobile games. Europe counts innovative mobile game developers and pure players such as Citymapper or Yuka.
9. The Yuka app enables the user to scan food and cosmetic products and analyzes their impact on health. Citymapper calculates, in real time, the routes of urban transport users, by combining several modes of transport⁷. Both these apps transform user behavior: Yuka users report that they switch to more healthy alternative food products. Another app that aims to change user behavior is the Greenly app which informs users on the greenhouse gas emissions generated by their consumption pattern, obtained via their bank transactions.
10. The success of apps such as Yuka, Citymapper and Greenly, hinges on the reliability and completeness of the underlying databases. These types of apps serve as an interface that collects personal data and combines this data with large external data sets before presenting the result to the user. In interviews conducted for this study, several app developers stated that **future innovations in apps will not come from hardware developments but from the software side**.

⁵ Thelle M. H. et al (2017)

⁶ Criteo

⁷ These include public transport networks, taxi and self-service rental networks (scooters and bikes).

11. App developers shared during the interviews how they think apps will permeate more and more aspects of our lives. Areas where the use of mobile apps will further increase in Europe are mobility, hybrid events, education and healthcare, with online health records and connected medical devices. In addition, 5G networks allow a higher connection density which permits the use of many connected devices into the Internet of Things (IoT). The higher speed and lower latency of 5G will allow developers to create richer user experiences, further increasing the use of apps.
12. The interviews were conducted during the public health crisis in February-April 2020. It was generally perceived that **the crisis brought awareness of the important place of apps in everyday life**. During the lockdown period, apps were used for public services, such as education or health. This is one illustration of how apps went from a nice-to-have product to a must-have product. We can expect the value created by mobile apps in the European Union economy to grow significantly in the years to come.



⁸ In the European Union, 75 million people have a personal internet connection only through their smartphone, and no personal fixed internet subscription.

1 Mobile app platforms and the “economy of platforms”

1.1 Mobile app markets are typified by a specific market structure

1.1.1 A presentation of app platforms

13. Mobile apps and app stores were originally introduced by Apple with the launch of the first iPhone in 2007. Since then, the phenomenal growth observed in this market has been fueled by the entry of several innovative competitors in mobile devices and app store markets. Competitors in the mobile device market include HTC, Huawei, LG and Samsung. The main competitor of Apple’s app store is Google Play⁹.
14. **Moreover, the range of app platform actors is wider than Apple Store and Google Play. Different types of platforms co-exist.** Native app stores belong to the major mobile OS developers, most notably iOS, Android and Windows. Third-party app stores involve manufacturer-specific app stores, including Samsung, LG, Motorola and Lenovo, but also carrier-specific app stores, such as Vodafone, T-mobile and TIM store.
15. Depending on the service provided by the app, apps not only run on smartphones, but may also run on other types of devices, such as connected televisions, game consoles, virtual reality headsets or PCs. **This report focuses on the mobile channel.**
16. Developments in mobile devices and app store markets significantly increase the capabilities of mobile devices and the utility they provide to users.

“From a battle of devices to a war of ecosystems”

Stephen Elop, former Executive Vice President of Microsoft’s Devices and Services and former CEO of Nokia Corporation, speech at D9, June 1, 2011

17. **Hence, in the mobile communication industry, the role of apps and app platforms is key.** According to the former CEO of Nokia, this market is turning from “a battle of devices to a war of ecosystems”¹⁰. Indeed, based on the theory of network externalities¹¹, the development of app ecosystems and apps has been crucial to the business strategy of leading mobile operating system providers. Network externalities imply that attracting developers in an app ecosystem will lead to a large number of available apps, which will attract a large number of users and underpin device sales¹².

⁹ Néstor Duch-Brown (2017)

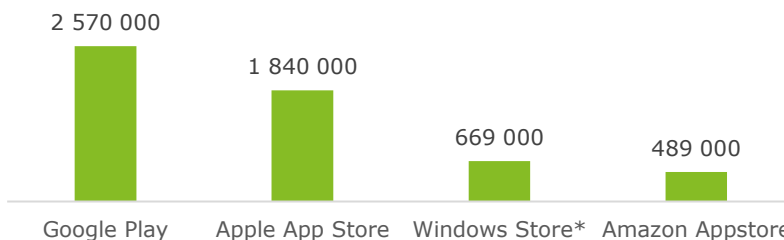
¹⁰ Stephen Elop, former Executive Vice President of Microsoft’s Devices and Services and former CEO of Nokia Corporation, speech at D9, June 1, 2011

¹¹ Hyrynsalmi, Suominen and Mäntymäki (2016)
Katz, Shapiro (1985)

¹² Holzer, Ondrus (2011)

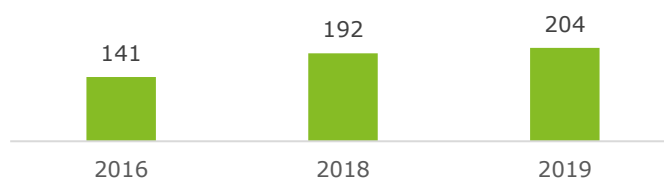
18. At the end of 2019, about 2 570 000 apps were available on Google Play, and 1 840 000 on the Apple App Store (Figure 1). **App stores host a large number of apps, and the number of apps downloaded from app stores is increasing significantly** (Figure 2).

Figure 1. Number of apps available in leading app stores as of 4th quarter 2019, worldwide



Source: Appfigures; VentureBeat

Figure 2. Number of mobile app downloads worldwide from 2016 to 2019 (in billions)

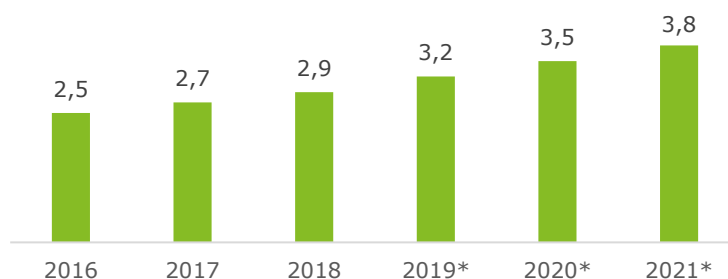


Source: App Annie; VentureBeat

Note: iOS App Store, Google Play and third-party Android stores combined. Downloads are first time downloads only

19. The use of smartphones is also linked to the interest of consumers in apps and the utility they derive from this market. The number of smartphone users worldwide has increased from 2.5 to 2.9 billion between 2016-2018 and is expected to reach 3.8 billion in 2021 (Figure 3). This represents a Compound Annual Growth Rate (CAGR) of 9 % over the period 2016-2021.

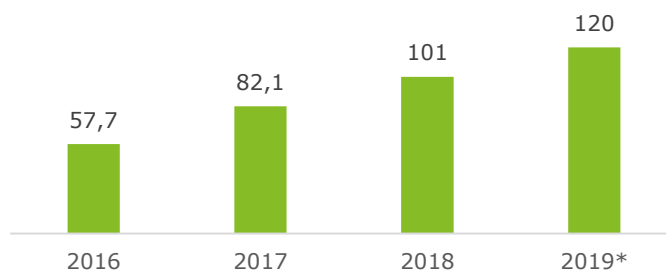
Figure 3. Number of smartphone users worldwide from 2016 to 2021 (billions)



Source: Newzoo. * are forecasts

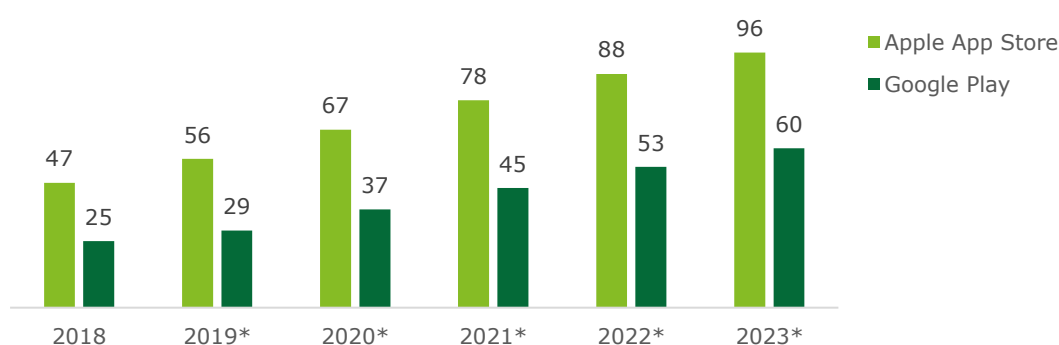
20. This increase in smartphone usage has been accompanied by an increase in consumer spending on mobile apps from USD 57.7 billion in 2016 to USD 120 billion in 2019 (Figure 4). This represents a CAGR of 28 %. Moreover, worldwide mobile app consumer spending is expected to grow on Apple App Store (from USD 47 billion in 2018 to USD 96 billion in 2023) and on Google Play Store (from USD 25 billion to USD 60 billion) (Figure 5).

Figure 4. Worldwide consumer expenditure on mobile apps from 2016 to 2019* (billion U.S. dollars)



Source: App Annie; Forbes. * are forecasts

Figure 5. Mobile app consumer spending worldwide from 2018 to 2023, by store (billion U.S. dollars)



Source: Sensor Tower; 9 to 5 Mac. * are forecasts

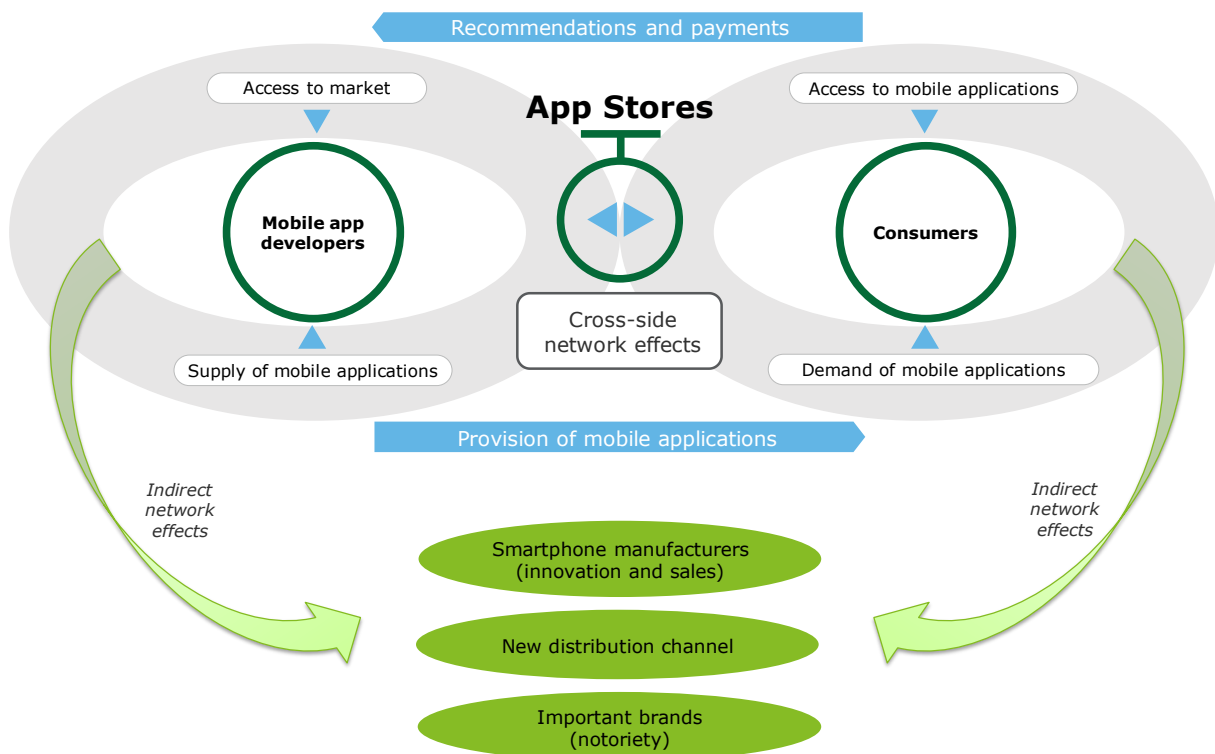
1.1.2 App stores are “multi-sided markets”

21. In the information and communication technology (ICT) sector, app stores have a central position in the provision of digital services by connecting app buyers and sellers. Economic literature uses the concept of "multi-sided market" to define this type of market. Two-sided markets are characterized by the presence of (cross-side) network effects: the utility which users on one side of the market derive from their participation in the platform depends on the number of participants on the other side of the market.
22. The mobile app market is a "multi-sided market", bringing together app developers on one side of the market and mobile phone (smartphone) users on the other side¹³. This specific market structure benefits both users and developers:

¹³ Hyrynsalmi, Suominen & Mäntymäki (2016), Rochet, Tirole (2003), Armstrong (2006)

- **For mobile app developers:** app stores represent an efficient distribution channel. More generally speaking, the rise of the internet has reduced distribution costs and has made it easier to serve niche markets, also coined as reaching the “long tail” of the market. App stores further reduce these costs by making it easier for developers to access a wide potential market with limited marketing and advertising expenditure.
- **For mobile app users:** thanks to platforms, end users have a one-stop-shop with access to a host of apps. A multitude of websites would make searching and choosing apps more time-consuming for users. The cost-reduction in reaching end-users yields greater competition and reduced prices.

Figure 6. The mobile app market



Source: Deloitte Economic Advisory

1.2 The positive effects of app stores

23. Economists studied specificities of the mobile app market¹⁴ and analyzed benefits introduced both on the supply side and the demand side. The positive effects of app stores for developers and users are presented in the following sections.

1.2.1 App platforms generate benefits for app developers

App platforms benefit developers by being the main intermediary between apps and users.

24. App platforms are accessible to all users. Users mainly install apps via an app platform. Even though users have the possibility to download an app directly from the developers' website or by jailbreaking their phone, it requires technical knowledge and might be risky.¹⁵

App stores create trust capital for developers.

25. **App stores create a relationship of trust between users and developers, stimulating the demand for app development.** Indeed, the success of developers depends on creating and maintaining trust of users, and app stores are a cornerstone in establishing trust between users and developers. App stores draw up contracts with each developer and verify all new app updates before they are released. This is beneficial to users due to the approval process behind the submission of each app. Consumer recognition for Apple or Google reflects the trust they place in their respective app stores.¹⁶

App stores reduce transaction costs for developers

26. The economic literature suggests that **app stores reduce transaction costs¹⁷ for developers.** App stores provide a variety of ready-to-use services for developers such as:

- ubiquity in user interface/user experience features,
- a secure platform to promote their products,
- storage systems for hosting apps and managing downloads,
- a billing service,
- a payment management system (micropayments) which makes it easy for mobile app developers to recover sales revenue.

27. Each developer avoids having to create and manage these services when using a centralized platform. **Marketing and operational costs are therefore lower.**

28. **App stores provide their services to app developers through a standardized contract.** The harmonized legal framework effectively reduces information asymmetry between the different developers. This has the effect of **reducing transaction costs by reducing negotiation costs** (i.e. this framework prevents a proliferation of contracts).¹⁸ In addition, standardized contracts also assure that larger developers do not negotiate better terms than smaller developers.

¹⁴ Heitkoetter et al. (2012), Holzer et al. (2011), Parker and Van Alsyne (2000), Rochet and Tirole (2006).

¹⁵ Kramer, J and Zierke, O (2019)

¹⁶ Cuadrado et al. (2012), Hyrynsalmi et al. (2014), Yun et al. (2017), Lee et al. (2014), Roma et al. (2012).

¹⁷ Transaction costs were defined by the economist Ronald Coase "*When one wants to carry out a market transaction, it is necessary to discover who it is that one wishes to deal with, to give them certain necessary information and set the conditions of the contract, to conduct negotiations that result in a bargain, to draw up the contract, to put in place control structures to make sure that the terms of the contract are being observed by both parties, etc.*".

¹⁸ Amit and Zott (2001)

29. App stores provide ready to use interfaces for integrating advertisements into apps, thereby reducing research and transaction costs for developers¹⁹. Advertising departments of app stores are used by developers who wish to display advertisements on their app. This service combines several tasks – such as technology management and payments – together into one interface, reduces marketing effort and transaction costs for app developers. Without this service, developers would be forced to find an agency themselves, contract with them and manage payments.
30. A whole range of tasks required to market a mobile app is thus managed by app stores. All these services contribute to **reducing time to market for developers**²⁰.

App stores facilitate entrance to markets

31. App stores **facilitate developers’ – and especially small business developers’ – entrance into markets**²¹. The platforms effectively enable fast and inexpensive access to smartphone users around the world. Low barriers to entry means that even the smallest businesses have access to 3.5 billion smartphone users globally²². Facilitating market entrance of small innovative companies increases the sustainability of this dynamic ecosystem.

App stores reduce apps’ production costs.

32. **Mobile platforms benefit from economies of scale and efficiency gains.** App stores can spread costs across a large customer base, thereby lowering costs for all listed developers²³.
33. Moreover, app platform’s developer membership, in addition to giving developers the possibility to distribute their apps worldwide, provides access to high-quality programming tools²⁴ such as tools to realize in-app purchases and subscriptions and, in the case of Apple’s app store, ARKit and Core ML which provide augmented reality and machine learning services. This reduces the need for developers to invest in software programming tools and, therefore, **brings down the cost of developing mobile apps.**

App stores enable developers to choose their payment modalities.

34. **App stores offer developers freedom in their business models.** Developers are free to choose how their apps are remunerated. Today there are seven leading business models: distribution channel, paid download, in-app purchase, subscription, in-app advertising, freemium and paidmium²⁵. They are explained in Table 1²⁶.
35. Apps do not necessarily have a single business model: they have the possibility to **generate revenues via several channels**, offering options to the user. These business models are called **hybrid monetization**. The number of apps using hybrid monetization has increased by more than 50% between 2017 and 2018²⁷.

¹⁹ ITU (2016).

²⁰ Cuadrado et al. (2012).

²¹ Roma et al. (2012), Pon (2015), OECD (2013), Ershov (2018).

²² <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>

²³ Rob Frieden (2017).

²⁴ Cuadrado et al. (2012).

²⁵ A Freemium app is downloaded for free on app stores, but users do not have access to all the features: they are encouraged to pay or subscribe for advanced features. In the Paidmium model users pay for the download and can also make purchases in the app.

²⁶ Tang (2016).

²⁷ <https://admob.google.com/home/resources/monetize-mobile-game-with-ads/>

36. The paidmium model is an example of a hybrid business model, in which users have access to differentiated services depending on the app-features they choose. Users first pay to access common features and are offered the possibility to pay for additional features.
37. Other forms of hybrid monetization exist beyond the paidmium model. A growing number of developers²⁰ are finding that **ads can co-exist with other sources of revenue, such as in-app purchases or subscriptions**. Some apps, for example, offer a free version on which they display advertisements. The consumer can choose to pay for a free-of-ads premium version. **The revenue stream is determined by the user's willingness to pay.**
38. **Hybrid monetization is frequent in mobile games**. Most players are not willing to pay for games, so advertising has become the most popular way of monetizing these apps. However, to capture revenues from users that are willing to pay, many games also include in-app purchase items. Another possibility for developers is to display in-app purchase announcements: this is a way to convert some players into paying users²⁸.
39. Reader-apps allow users to read various digital content within apps: videos, music, documents, books, including digital content purchased outside the app. For instance, Youtube, Netflix, Spotify, Kindle, and Audible are reader-apps. **Reader-apps often use hybrid monetization:** users have the choice between a free version, with ads and/or limited features, and a paid version. For example, Spotify is either free with ads after every 6 songs, or users can subscribe and pay for a premium version without ads on which they also benefit from exclusive features²⁹.

Multi-homing is an available option for all app developers

40. **The presence of several coexisting app stores allows multi-homing for developers.** When Multi-homing a developer publishes its product on several platforms. Even though multi-homing is not used by all developers, exclusive contracts between an app and an app store are very rare³⁰. Multi-homing is an option available to all developers and give them access to each user.
41. **Multi-homing is very common for the most attractive apps³¹**. The largest app developers and companies – such as banks or airline companies – that wish to interact with their clients usually contract with several app stores to publish their apps. Moreover, when an app initially published on one app store meets great success, it is often developed for the other app stores³².

²⁸ <https://static.googleusercontent.com/media/www.google.com/en//admob/pdf/admob-mobirix.pdf>

²⁹ Including offline listening, higher quality audio streams, unlimited playlists

³⁰ Sami Hyrynsalmi, Arho Suominen & Matti Mäntymäki (2016)

³¹ Bresnahan, Timothy F. et al. (2014)

³² Lévêque, François (2016)

Table 1. Different business models available to mobile app developers

Business model	How it works	Examples of mobile apps
Single business models		
Distribution channel (Sale of goods and services)	Goods purchased in the mobile app are sent directly to users. Apps make the shopping experience frictionless and enable provision of new services.	Amazon eBay Uber/Lyft grubHub
Paid downloads (Paid)	Payment is made at the moment the app is downloaded (with access to all the app features).	Grand Theft Auto – San Andreas FaceTune Terraria
In-app purchase	Apps are offered free of charge. Users can pay for additional services or add-ons in the app (this business model is found mainly on gaming applications.)	CandyCrush Clash of Clans Brawl Stars
Subscription	The user must pay a monthly subscription to be able to use the app.	Netflix Coyotte
In-app Advertising	Installing and using the app is free. It displays advertising banners or video clips when it is used.	Rolly Vortex Helix Jump Waze
Freemium (derivative of in-app purchase)	The app is downloaded for free on app stores, but users do not have access to all the features. They are encouraged to pay or subscribe for advanced features.	Monster Strike TomTom Shazam
Hybrid business models		
Paidmium (derivative of in-app purchase)	Users must pay to download the app. They can also make purchases in the app (add-ons, etc.).	Minecraft - Pocket Edition Minecraft - Story Mode Ghost Blows Out the Light 3D
Other hybrid business models	Revenues are generated via a mix of business models, depending on the users' choice. Reader apps and games often use hybrid business models.	Spotify and Youtube: combination of in-app advertising and subscription ³³ Duolingo: combination of in-app advertising, in-app purchase and subscriptions ³⁴ Candy Crush: combination of in-app advertising and in-app purchase ³⁵

Source: Deloitte analysis

³³ Users either have access to a free version with ads or they can subscribe for an ad-free version with more features

³⁴ Users have access to a free version with ads, on which they can buy additional services. Users can also subscribe to an ad-free version with unlimited services.

³⁵ Users can play for free, with ads being displayed. Players can also make some in-app purchase.

1.2.2 Economic theory highlights various benefits introduced by app platforms for consumers

App stores reduce transaction and research costs.

42. **Platforms reduce the cost and time spent by users to search for an application**³⁶. The possibility for users to quickly discover new services and apps is a significant advantage offered by platforms. Using an app store is straightforward as users do not need any technical knowledge to install and use available apps.
43. **App stores offer users a single platform where they can download any app compatible with their smartphone's operating system.** This phenomenon of "*one-stop shopping*" reduces research and transaction costs. App stores offer users a single and secure interface for all their purchases on the platform.
44. **To facilitate the discovery of new apps, app platforms offer an editor-curated section to promote new high-quality apps.** The spotlight helps increase sales for the featured products. In addition, these editor's picks have spillover effects and stimulate sales of apps from the same developer and of the same app on other platforms³⁷. In addition, there is a weak spillover effect for the same type of apps (similar functionality but different developer).

App stores promote a variety of innovative, high quality mobile apps.

45. **App stores produce strong network effects conducive to the development of a rich and dynamic ecosystem of developers and apps.**³⁸ The distinguishing feature of cross-side network effects relies on the fact that the utility of an agent on one side of the market depends on the number of participants on the other side of the market.
46. **The large number of apps available on app stores pushes developers to constantly innovate to attract new users.**³⁹ As the pace of innovation and new developments is high, developers must be able to offer apps that meet users' new expectations⁴⁰.
47. **Platforms have made innovative services available to users. Without platforms, several services would not exist.** Uber, Tinder, TooGoodToGo and other apps that use geolocation would not exist without the development of mobile app platforms. These services require a geolocation system to operate and need to instantly reach a critical mass of users. App stores, with 3 billion users, offer developers means to create these new services.
48. **The fact that app stores enable app ratings has a positive impact on consumers.** The economic literature about the reputation effect demonstrates that there is a correlation between the viability of apps and their scores on app stores⁴¹. This system has the advantage of rewarding apps that better meet the expectations of end users and intensifies competition among developers. An app rated as "excellent" by its users is more likely to survive on the market than an app with a low rating.

³⁶ Ershov (2018), Cachon et al. (2008).

³⁷ Zhan et al. (2017).

³⁸ Cuadrado et al. (2012).

³⁹ Cuadrado et al. (2012).

⁴⁰ McIlroy et al. (2016).

⁴¹ Lee et al. (2014).

App stores also have a positive impact through the way apps are ranked

49. **Promoting high-quality apps is in the interest of app stores.** Major app stores include quality and performance metrics in their ranking algorithm. Experience has shown that people use high-quality apps more and uninstall them less⁴². Promoting apps based on their quality and value to users is in the interest of app platforms. In fact, app stores are partially remunerated by sharing the revenue generated by app developers through their platform.
50. Kramer and Zierke (2019)⁴³ analyzed the impact of app stores' ranking mechanism using a game-theoretic model. In their model, app stores can rank apps according to their quality (a quality-based ranking) or according to their financial contribution (sponsored ranking). The study reveals that **quality-based ranking has a high impact on app quality and consumer surplus if app stores accurately assess app quality**⁴⁴. Indeed, under a quality-based ranking, app developers will be more likely to invest in app quality in order to appear higher in the search results. This result is conditioned by the ability of app stores to accurately assess the quality of apps. The result underlines the importance of the review process of apps, the search algorithm and the editorial choice.

App stores benefit users in terms of security.

51. The consistent approval process behind the submission of each app benefits users. The apps downloaded by users thus present higher functionalities and present less risks to their device. The brand recognition the general public has for the Apple or Google app stores reflects the trust that users place in their respective app stores⁴⁵. For example, the Apple store's review process included since the early days a manual review of apps and put emphasis on protecting the total user experience, such as making sure users do not accidentally perform in-app purchases and are informed about the use of data. The two major app platforms conduct today an approval process that consists of an automatic, algorithmic part and possibly a manual part⁴⁶. A manual review is conducted for certain types of apps, such as in the case of apps for children⁴⁷.
52. **Moreover, app stores also moderate reviews and inappropriate content.** This is an important role as consumers are confident that negative reviews will not be deleted by the app developer, while preventing inappropriate content from being published.

⁴² Ahn, A. (2017)

⁴³ Kramer, J and Zierke, O (2019)

⁴⁴ The conclusions are based on certain hypothesis on the behaviors of the consumer, developer and app platform: in the model, the app store and the developer maximize profit and the consumer prefers to use high-quality apps.

⁴⁵ Cuadrado et al. (2012), Hyrynsalmi et al. (2014), Yun et al. (2017), Lee et al. (2014), Roma et al. (2012).

⁴⁶ Up till 2015, the Google Play review process of apps was entirely automatic.

⁴⁷ <https://www.cnn.com/2019/06/21/how-apples-app-review-process-for-the-app-store-works.html>

<https://yalantis.com/blog/apple-app-store-and-google-play-store/>

<https://www.androidpolice.com/2020/03/16/google-play-store-app-reviews-will-take-7-days-or-longer/>

1.3 App stores have an impact beyond the platforms' direct users

1.3.1 App stores generate indirect network effects

53. **App stores have a positive impact on smartphone manufacturers.** By increasing the number and the quality of apps available to users, the utility of the smartphone increases for users. This higher utility, in turn, increases smartphone sales⁴⁸.
54. Mobile app performance increases rapidly with the addition of new features.⁴⁹ Smartphone manufacturers, therefore, follow this trend by investing in research and development to offer their customers more efficient smartphones. **Mobile apps thus encourage smartphone manufacturers to innovate**⁵⁰.
55. Indeed, as highlighted in Figure 7, platform developers, content providers, third-party app developers and software developers provide content and services directly linked to the mobile devices market. **Innovations of smartphone manufacturers – triggered by mobile app performance – require electronic manufacturing services, original equipment manufacturers and original design manufacturers, as well as suppliers of raw materials and components such as metals, plastics and chips.**
56. The strong relationship between the mobile industry, app stores and apps, has been a cornerstone of the business strategy of leading mobile operating system providers when developing their own ecosystems. This strategy is based on the theory of network externalities⁵¹. **The multitude of quality apps will attract users, which will drive device sales, and leads to a virtuous circle**⁵².
57. Although a significant percentage of mobile apps do not generate revenue directly, **they provide an additional distribution channel and can give existing services a broader customer base.** For example, when the mobile eBay app was launched in 2009, more than €432 million in sales were made through the mobile application⁵³. More recently, start-ups have created business models based on consumer to consumer sales via mobile apps. OfferUp, which was founded in 2011, is now the largest peer-to-peer commerce marketplace⁵⁴. The mobile market has expanded to allow new innovative business models that are mainly based on sales and activity via apps.

⁴⁸ Holzer et al. (2011).

⁴⁹ According to a study by SensorTower, the size of mobile apps has continued to increase in recent years. Over the period 2013-2017, the size of the 10 most used applications on iPhones (Facebook, Uber, Gmail, Snapchat, Spotify, Messenger, Google Maps, YouTube, Instagram and Netflix) increased by 1,000% <https://sensortower.com/blog/ios-app-size-growth>.

⁵⁰ Cuadrado et al. (2012).

⁵¹ Sami Hyrynsalmi, Arho Suominen and Matti Mäntymäki (2016), Katz, M.L., Shapiro, C., (1985)

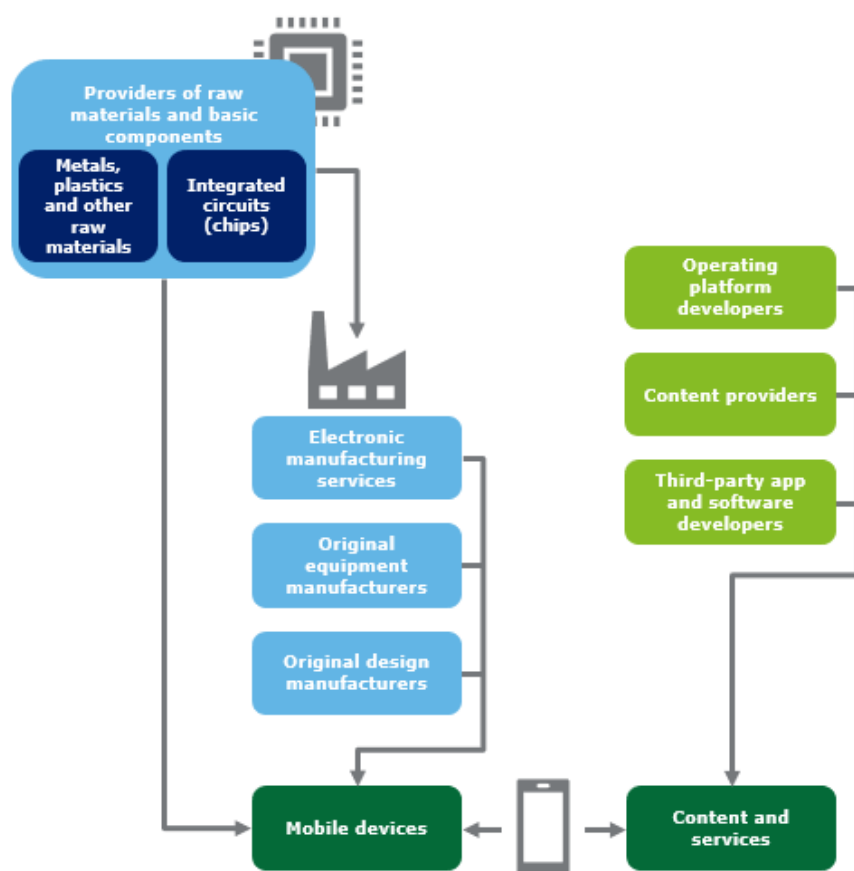
⁵² Holzer, A., Ondrus, J., (2011)

⁵³ eBay Inc. Annual Report 2009.

http://files.shareholder.com/downloads/ebay/923940436x0x361552/b45137ee-aa41-4c2c-94ca-d72d5b0844be/eBay_77655_BANNERLESS.pdf.

⁵⁴ <https://www.forbes.com/sites/zackfriedman/2017/01/09/meet-two-young-entrepreneurs-who-raised-221-million-to-disrupt-craigslist/#5b451f1e40d5>

Figure 7. Main suppliers of mobile phone groups



Source: Xerfi Global, 2019

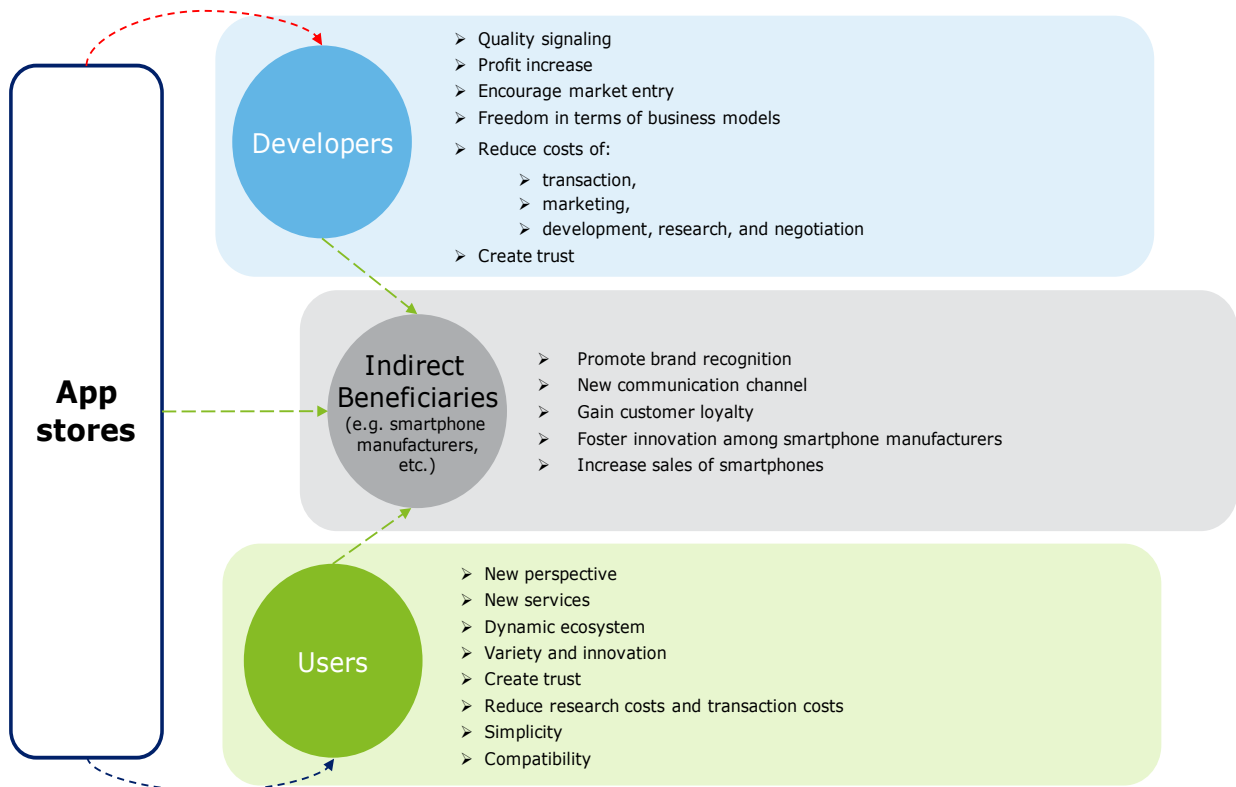
1.3.2 The platforms have been proactive in addressing several challenges such as personal information or payment

58. Mobile platforms manage users' and developers' personal information. They also manage financial transactions like payment for apps, in-app purchases, or payment of revenue to developers. The fact that sensitive information is increasingly digitized and stored on the cloud naturally raises concerns about inappropriate use or exposure to unauthorized entities. To prevent this risk, **app stores invest heavily in cyber security**⁵⁵.
59. Moreover, the centralization of personal data on online platforms could pose a problem for the pricing of applications. Since platforms have access to the complete purchase history of users, they could have a precise idea about users' willingness to pay and therefore offer services at the highest possible price. This fear is unfounded to the extent that **app stores do not set the prices of apps, this decision being the sole prerogative of developers**⁵⁶. Since developers do not have access to other consumer app purchases, they cannot leverage that information for pricing decisions.

⁵⁵ "Cybersecurity has been a part of Apple's DNA for a long time, and embedded into all of its products" Steve Morgan, Founder and Editor-in-Chief of Cybersecurity Ventures (Cybersecurity Q1 2018: Trends and takeaways <https://investingnews.com/daily/tech-investing/cybersecurity-investing/cybersecurity-update-q1-2018-review/>

⁵⁶ OCDE (2013).

Figure 8. Benefits generated by app stores



Source: Deloitte analysis

2 The economic weight of the mobile app market in the European Union

60. This section quantifies the mobile app market in the EU. We start with user statistics that characterize the increasingly important role of the app-ecosystem in daily life (section 2.1). Section 2.2 discusses how the app-ecosystem enhances consumer well-being and contributes to growth. Figures on revenue generated by the app economy and on employment are presented in the following two sections, 2.3 and 0.

2.1 Presentation of the mobile app market in the European Union

2.1.1 Increasing adoption of the app-ecosystem the European Union

61. In 2018, the European Union counted 677 million mobile phone subscriptions, corresponding to a mobile penetration rate of 132%. Smartphone adoption increased by 9.5% in 2019, reaching 76% of mobile phone connections⁵⁷. This figure is expected by the GSMA (GSM Association) to reach 83% by 2025.

62. With increasing smartphone adoption, a new category of internet users emerged across Europe: the mobile-only population. This category is characterized by people having only a mobile subscription and no fixed broadband subscription. Mobile-only users represent 15% of the EU's population in 2018⁵⁸.

63. On average in 2018, Europeans spent 185 minutes per day on their mobile phone, and 46% of them spent more than 3 hours per day⁵⁹. 88% of the time spent on a mobile is dedicated to the use of mobile apps⁶⁰.

2.1.2 Business models of the app economy

64. App development takes place at a diverse selection of companies⁶¹. Some, such as mobile game companies, develop and maintain their own apps and distribute them via the app platforms. Their revenues are obtained directly from consumer payments for the app and/or sale of ad-space. A closely related business model is used by mixed companies that propose services that run both on desktop and on mobile (for example Deezer and Spotify).

65. Large companies that use mobile apps to support their business or which provide mobile services to their customers, might have in-house developers. This is for example the case for Danske Bank. The more common arrangement however is to outsource app development and maintenance. Many software companies in Europe thrive on this business model, developing apps for enterprises. An important category are apps that serve as distribution channels for consumer goods (M-commerce).

⁵⁷ Source: GSMA

⁵⁸ Estimate based on ITU data. Cf. Appendix 5.1.

⁵⁹ Interactive Advertising Bureau, 2017

⁶⁰ Comscore, 2018

⁶¹ Thelle M.H. et al (2017)

66. Six different sources of revenue are generated via apps. The analysis of the app economy's weight in the European economy quantifies each of them:
- Developers can generate revenue by **charging for the download of their app**.
 - Developers can opt for **in-app purchases**. In this case, developers provide their app for free to increase the user base.
 - Developers can also be compensated by offering a subscription for the use of their application. This is the case with several newspaper or periodical apps, such as the Economist, for which consumers pay a subscription fee to access articles.
 - Developers can be paid by **displaying advertisements in their app**. This payment method is possible for both free and paid apps.
 - Developers can be paid as subcontractors for the development of apps that support the clients' business. Examples are apps that provide mobile banking services and apps that are a distribution channel for consumer goods (M-commerce).
 - Many retailers use **a mobile app to open a new distribution channel for consumer goods**. For example, the Amazon app allows orders to be placed directly without using a PC. To access a large clientele, retailers provide their app for free in app stores. Revenues generated through this channel are grouped under the name of mobile commerce or M-commerce.

Table 2. Revenue sources via apps

Revenue for developers				Revenue for retailers	
Revenue generated on app stores			Sale of ad-space	Contract work	Online sales platforms
Paid download	In-app purchases	Subscriptions	Mobile ads	App development for clients	Distribution channel
a	b	c	d	e	f
Revenue generated by the sale of apps on app stores	In-app purchases (including <i>Freemium and Paidmium</i>)	Revenue generated by subscriptions	Revenue generated by mobile advertising	Revenue generated through contract work	Mobile-commerce ⁶²

Source: Deloitte analysis

67. The revenue generated through sources *a* to *e*, – i.e. on app stores, through the sale of in-app ad-space and through subcontracting – is revenue for developers. M-commerce revenue is different in nature. Indeed, developers are remunerated for the development of the app; however, the sales-revenue accrues to retailers. M-commerce apps facilitate the sale of goods and services that are generally also available via alternative distribution channels.

⁶² Mobile-commerce includes all commercial transactions carried out on mobile devices, both via web apps and via native apps. The transactions are possibly carried out on the move, but also at home.

68. The first four revenue sources (a-d) can also be combined (hybrid monetization). For example, games can be monetized through a combination of in-app ads and in-app purchases. In the EU, video games account for 67% of total revenue generated via app stores. In 2019, three European mobile game companies generated more than €1 billion in revenues, app store revenues and advertising combined (Table 3).

Table 3. Top European mobile game developers

Company	Number of games available on app platforms	Total downloads (million)	Revenue 2019 million Euros
King	52	2 800	1 813
Supercell	13	1 800	1 400
Playrix	6	995	1 100 ⁶³

Source: Activision Blizzard 2019 Financial results (King), [Financial Times](#) (Supercell), Sensortower (Playrix)

2.2 The app-ecosystem stimulates growth and increases consumer well-being

69. The new products and services offered by apps increase consumer choice and consequently, their well-being. Indeed, the rapid adoption of smartphones and apps demonstrate the preference of many consumers for apps over alternative channels. In addition, growth is stimulated by the creation of new products which offer new ways to generate revenue. Finally, growth is stimulated by the increase in efficiency due to the use of mobile apps. Each of these aspects is detailed below.

2.2.1 The app ecosystem creates new services

70. A mobile device has many functionalities which make interaction intuitive and fast: geo-localization, a camera, a microphone, a tactile screen and movement detection. In addition, a smartphone is a device that can be taken anywhere: 91% of smartphone owners report they never leave home without their phone⁶⁴. With mobile devices, new user experiences have emerged: augmented reality used in games or services, games based on the movement of the smartphone itself, ride-hailing services, dating apps that use geo-localization, online market places for used items, health apps, etc.

71. In the future, apps are likely to offer more and more new types of services as they will adopt technologies such as virtual reality (VR), connection of smart objects (internet of things IoT) and the analysis by artificial intelligence algorithms of user data collected through apps, combined with other data sources. Below, we discuss several categories of apps that use the specific features of mobile devices.

⁶³ In-app purchases only

⁶⁴ Ward, A. (2016)

Games

72. Many games, such as casual and hyper-casual games⁶⁵, only exist on smartphones. In 2019, there were more than 165 million game app users in Europe⁶⁶, which is 32% of the population⁶⁷. Games account for 10% of user time spent in apps⁶⁸.
73. Mobile games offer new experiences to users. The players' experience is often built around the tactile screen. For instance, the Swedish game Candy Crush Saga is based on tactile screen specificity: the game is played by swiping candies in any direction.
74. Innovation is also important for app games. A more recent development in the game industry is the introduction of augmented reality (AR) technology. Apps using AR create an interactive user experience, overlaying digital objects with the real-world environment, thus creating composite views that augment the real world. The most common use of AR is a digital image being viewed through the smartphone's camera. Artificial environments are created, and users can interact with them by moving the phone swiping and clicking. AR apps do this by accessing the smartphone's camera, motion sensor and geo-localization.
75. For example, the ARrrrgh app, developed by Warping Media AB (Sweden), uses the tactile screen, geo-tracking system, and camera to offer players an AR experience in a classic hide and seek game that transforms players into modern-day pirates. Players look for digital-generated treasures hidden in the real world through their phone's camera.

Ride-hailing services

76. Ride-Hailing applications offer a new type of service thanks to the geo-location of the user. Ride-hailing apps connect clients and drivers through an app, and the geo-tracking system finds a car close to the client. Both the client's waiting time and the distance the driver has to drive to pick up clients are reduced, increasing efficiency for both passengers and drivers.
77. Ride-Hailing apps have been present in the EU for about 10 years, with the introduction of Uber in Paris in 2011. Uber remains the most used app in the EU, but many similar companies were successfully created all around Europe, offering ride-hailing services to millions of users.

Dating apps

78. Dating apps offer customers new types of dating services. For dating applications, geolocation is a crucial feature as the app matches users geographically close to each other. Happn relies on this feature: the app allows users to see all other users they cross paths with while on the move. Whenever registered users walk by each other, the app shows them their respective profiles and a map of where they crossed.
79. Tinder is another example of new experience introduced by apps. It relies on the tactile screen: users slide other user's picture to the right or left on the screen if they like or dislike the profile.

⁶⁵ Casual games are games targeted at a wide audience. Hyper-casual games are very easy-to-learn games that usually monetize with in-app ads.

⁶⁶ The term "Europeans" or "Europe" refers throughout the report to the geographical region and may include countries that are not part of EU28.





⁶⁷ Statista, *Digital Market Outlook, Mobile Games*

⁶⁸ AppAnnie, *Worldwide Data, 2019*

Other types of apps that offer new services

80. Apple's ARKit and Google's ARCore developer tool were released in 2016, allowing AR experiences to be included in more apps and allowing AR to go beyond game apps. AR features are now implemented in many app categories: lifestyle, shopping, learning, culture. This new technology is widely adopted by European developers (cf. 81).
81. Health apps also offer a new type of service and are widely adopted. Health information, such as duration of sleep or total number of steps can be recorded using motion and location sensors, sometimes in conjunction with a connected device. The possibility to connect smartphones with other (medical) devices allows the phone to record extensive data on users' health.

Figure 9. Presentation of 4 European non-gaming apps using AR

AR apps transforms shopping experience	Education is a great use for augmented reality
	
IKEA Place	BBC Civilizations AR
<p>Shopping experiences have been transformed by AR apps. Ikea adopted AR within its app Ikea Place (2017). The app allows people to virtually place and visualize Ikea furniture in their house. Buyers' decisions are facilitated as they can check both the size and the style of the furniture.</p>	<p>The BBC developed the Civilizations AR app (2018), giving users the ability to admire diverse historical artifacts. Interested users can visualize ancient treasures in lifelike 3D, see inside it with an X-Ray function, and hear about its history at the same time.</p>
	
Style My Hair: try on & color	Big Bang AR
<p>AR is also rapidly expanding in beauty and fashion apps. L'Oréal uses AR in its app Style My Hair (2015): users can visualize haircuts and color before going to the hairdresser. The 3D hair color technology follows the natural flow of users' hair, making it easier to decide which color is right for them.</p>	<p>Also research centers adopted AR technology. The European Organization for Nuclear Research, in collaboration with Google Arts & Culture, developed an AR app that dives users in a journey through the birth and evolution of the universe.</p>

2.2.2 The app-ecosystem increases efficiency in firms

82. Apps provide a fluid device-user interaction and offer personalized services. These characteristics offered by the app ecosystem have the potential to improve efficiency of many types of professional tasks like e-mails, expense reports, conference calls, etc. The economic role and impact of mobile internet use and apps can be regarded as distinct from fixed internet connection⁶⁹. The influence on firms of mobile and apps has been little studied. However, a few studies indicate a positive relationship between the smart mobile office and firm productivity.
83. Mobile devices and applications coupled with workplace flexibility have been shown to enhance labor productivity. A 2015 study on the use of mobile internet in firms reveals a significant increase in labor productivity with an increasing penetration rate of mobile devices amongst employees⁷⁰. Moreover, the study reveals a causal relationship, meaning the data studied support the idea that mobile use causes the increase in labor productivity.

2.2.3 The app-ecosystem has a positive impact on consumer well-being

Consumer preference for apps

84. Smartphone- and app-use displayed impressive growth in recent years. Europeans spent 19% more on apps in 2019 than in 2018 and the total number of apps downloaded grew by 7%. European smartphone owners downloaded on average 31 new apps in 2019⁷¹. 76% of people spend more than an hour per day on their mobile phone and 88% of time spent on a phone is spent in apps⁷².
85. Several European companies that were already proposing online services to consumers and launched an app, benefited from broad and quick adoption by users. For example, when the Lithuanian company Vinted introduced its app in 2012, one day after the release, 30% of traffic came from the app⁷³. The DB navigator app from German railway company Deutsche Bahn saw a 50% year-on-year increase in active users mid-2019, after implementing new functionalities⁷⁴.

Mobile-only population

86. Another development showing an increase of consumer well-being due to the app-ecosystem is linked to the growth of the "mobile-only" population. This choice has become attractive thanks to the generalization of high-speed and very high-speed mobile data networks and affordability of smartphones. Access to information and services via mobile sites and apps are important for this category of population.
87. Based on ITU databases, 15% of Europeans are smartphone-only, representing a total of about 75 million people (cf. appendix 5.1 for the methodology).
88. Choosing to only access the internet via a mobile device is possible because of the high-quality user experience offered by mobile websites and apps. The growth in size of the mobile only population shows that when having the possibility, many users opt for mobile-only. This choice allows them to save costs on a fixed internet subscription, optimize their budget and increase consumer welfare.

⁶⁹ Draca et al (2018)

⁷⁰ Viète S. and Erdsiek D. (2015), Bertschek, I. and Niebel, T. (2015)

⁷¹ These are unique installations. Source: GSMA.

⁷² Comscore, 2018

⁷³ Vinted offers a platform for CtC apparel sales. Source : <http://lemonlabs.co/vinted/>

⁷⁴ Deutsche Bahn, 2019 Interim Results Press Call

2.3 The value created by the app economy in the European Union

2.3.1 The app economy creates value in the European Union *via* several channels

89. The study of the economic value of the app economy in the European Union is divided into three parts:

- Direct economic impact: this includes the total direct revenue earned by companies in the sector. This direct impact is calculated by evaluating the revenues generated through downloads, in-app purchases, subscriptions, in-app advertisement and contract work. Most of these revenues are generated via the app platforms.
- Impact due to spillover effects: an important spillover effect of the app ecosystem is the rise of M-commerce. The revenues generated by sales through mobile sites go to retailers, wholesalers and producers⁷⁵. In addition to the choice of consumers to purchase standard products like clothing and even tickets via mobile apps, M-commerce also brought new types of services. The revenues associated with the new types of services are considered as economic activity created by the app-sector.
- Indirect impact: because the different sectors of the economy are interdependent, the app economy generates wealth beyond the companies in the app industry. These indirect impacts include both impacts on other productive sectors as impacts on households. These indirect impacts are quantified according to the methodology presented in section 2.3.4.

2.3.2 Direct economic impact of the mobile app market in the European Union

Revenue generated directly on app platforms

90. In 2019, app platforms generated a total revenue of €5.7 billion in Europe, of which 67% stems from mobile games⁷⁶. This revenue comes from paid downloads, in-app purchases and subscriptions. Europe accounts for 11% of global app platform revenue. App platform revenues from European users increased by 25% in 2019⁷⁷. If growth continues at the same rate in 2020, revenue generated via app stores could reach 7 billion in 2020.

Revenue generated by in-app advertising

91. Many apps are free to download and use. In this case, developers generally gain revenues from selling in-app ad-space. According to data gathered by eMarketer, in 2019, mobile ad revenues represented €23.3 billion in Europe⁷⁸.

⁷⁵ The developers are remunerated for the development and maintenance of the app.

⁷⁶ Source: SensorTower. Included countries are: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, The Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

⁷⁷ The growth rate is calculated in euros.

⁷⁸ Source: eMarketer

Revenue generated through contract work

92. Many apps are developed by software companies for third party clients to meet specific needs. These can be B2B or B2C apps⁷⁹. B2C apps provide value for the client by delivering mobile services to the final consumers, thereby for example increasing their competitiveness. Common examples are banks that provide apps for mobile banking or retail apps. B2B apps, by enabling mobility, can stimulate productivity, enhance well-being at the workplace and increase efficiency in B2B relations and transactions. Apps are used for business tasks such as e-mail, online collaboration, inventory management, automation of the purchase process and many more. These practices are already widely adopted: in 2018, the share of revenue from web sales in the EU was mainly realized via enterprises' own websites or apps⁸⁰.
93. Companies are increasingly interested in having their custom apps: the share of developers' revenue coming from the development of custom apps for businesses increased from 23% in 2014 to 32% in 2016⁸¹. We can expect an increase in the demand for mobile apps, since young business owners are the ones developing the majority of mobile apps: 55% of small business owned by millennials have a mobile app, while only 13% of small business owned by baby-boomers have one.
94. The development of these apps is sometimes done in-house in the case of large firms, but is generally subcontracted to specialized app-development firms.
95. These apps do not generate revenue via the app store. Developers are directly remunerated for the development of the app by their client. The value for the client is in the services these custom apps provide, either for internal processes or for its clients (businesses or final consumers).
96. We estimate the revenue generated through contract work at €55.6 billion in 2019. This estimate is based on data obtained by Gigaom in 2013, extrapolated to today, assuming equal growth rates of contract work as of total sector revenue⁸².

The direct revenue generated by the app economy, comprising the revenue generated via the app platforms and in-app ads, represented for the European market in 2019 €84.6 billion.

⁷⁹ B2B stands for business to business, B2C for business to consumers.

⁸⁰ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=E-commerce_statistics

⁸¹ ContractIQ, 2017

⁸² Gigaom Research, 2014. This estimate is likely conservative given the dynamism of the business app market. More recent estimates of this share of the market were not available at this date.

2.3.3 Revenue due to the spillover effect on the retail sector: M-commerce

The app-ecosystem also has a spillover effect on commerce and retail. Mobile apps open a new channel for generating revenues for retailers: M-commerce.

Revenue generated by M-commerce

97. M-commerce denotes the realization of commercial transactions by way of mobile phones. These transactions are conducted via native apps⁸³ or mobile web apps.
98. Unlike games or running apps, the user does not directly pay for the app, or for the services provided by the app. The consumer uses the app to purchase goods or services sold by third parties. The use of these apps does not directly generate revenue for their developers, but opens new distribution channels for retailers.
99. The goods and services purchased via mobile apps encompass many types of final consumer products: air and train-travel tickets, clothes, furniture, health and beauty products, tickets for events, electronic equipment, etc.⁸⁴ The value of M-commerce in Europe is estimated at €394 billion in 2019⁸⁵.
100. Also reader-apps⁸⁶ generate mobile-commerce revenue, as the app allows consumption of external digital content (for example books or music) in the app. Subscriptions or purchases can pass outside of the app platform. For instance, people buying digital or audio books can read them respectively on the Kindle and Audible mobile apps.
101. Mobile apps enable their users to change their consumption habits. Purchases formerly made via traditional distribution channels (shops, hypermarkets, commercial websites etc.) can be easily made on a digital device. However, because many (if not most) of the expenses made by consumers through mobile apps would have happened through another distribution channel, we do not attribute all of the M-commerce revenues to the app sector.

Methodology to estimate the contribution is of M-commerce to the European economy

102. M-commerce can have a positive effect on the growth of the European economy via two channels:
 - An overall positive effect on the retailing business is due to M-commerce's characteristic of ubiquitous access, creating an important advantage of shopping via mobile apps over desktop e-commerce⁸⁷. In addition, M-commerce presents other specificities such as the ability to personalize services by using geo-localization. However, while the overall effect of e-commerce on the EU economy has been estimated, there is, to date, no study on the effect of m-commerce on economic growth. This possible effect is not taken into account in this study.

⁸³ Native apps are apps that are developed for a specific platform or device. Because of this, the app can use hardware and software specific to the device.

⁸⁴ Eurostat publishes extensive data on e-commerce in the European Union. We hypothesize that the list of consumer products acquired via mobile phone is similar to the range of products acquired via any internet site. https://ec.europa.eu/eurostat/statistics-explained/index.php/E-commerce_statistics_for_individuals

⁸⁵ This estimate is based on Eurostat data and data by Criteo. Details can be found in appendix 5.2.

⁸⁶ Defined in paragraph 28.

⁸⁷ Rajan Y. et al (2016)

- Apps and the app-ecosystem gave birth to new types of products such as ride-hailing apps that use geo-localization. **We consider only the revenues of these new types of products as specifically generated by the app-sector.**

Contribution via mobile sales of new types of products

103. To estimate the contribution of M-commerce to the growth of GDP, the sales of new types of products via mobile channels are quantified.

104. The app-ecosystem gave rise to new types of services (cf. section 2.2.1) such as ride-hailing apps, dating platforms, gaming apps and several other apps that use the functionalities of mobile devices but do not generate much revenue (as of yet). In this category, we consider only ride-hailing apps revenues⁸⁸. Table 4 presents the results of this approach.

105. Europeans widely adopted ride-hailing services: the 6 main applications cumulated almost 35 million users in 2018. Over the same period, ride-hailing apps generated a revenue of about €1.6 billion in Europe.

Table 4. Revenues main ride-hailing apps in Europe (2018)

App	Location	Users (M)	Revenues (M€)
Uber	US	12	1 305
Kapten	France	10	181
Bolt	Estonia	10	79.7
Le Cab	France	0.07	15
Free Now	UK	0.5	9.1
Heetch	France	2	6.3
TOTAL		34.6	1 596

In 2019, sales via mobile apps (M-commerce) in the European Union represented €394 billion in direct revenues for retailers and producers. We consider that the revenue generated by new types of products is attributable to the app-ecosystem. This represents 0.4% of M-commerce revenues or €1.6 billion.

2.3.4 Indirect economic impact of the mobile app market in the European Union

106. In 2019, the total indirect contribution of the mobile app economy in the European Union represents €101 bn (Table 5). This includes revenue generated through supplier relationships (€60.9 bn) and revenue resulting from the spending by people employed in core app economy jobs and its suppliers (€40.2 bn).

⁸⁸ Dating apps and mobile games revenues are app store revenues (subscriptions, in-app payments, paid apps).

Table 5. Breakdown of the impact of the mobile apps beyond app developers

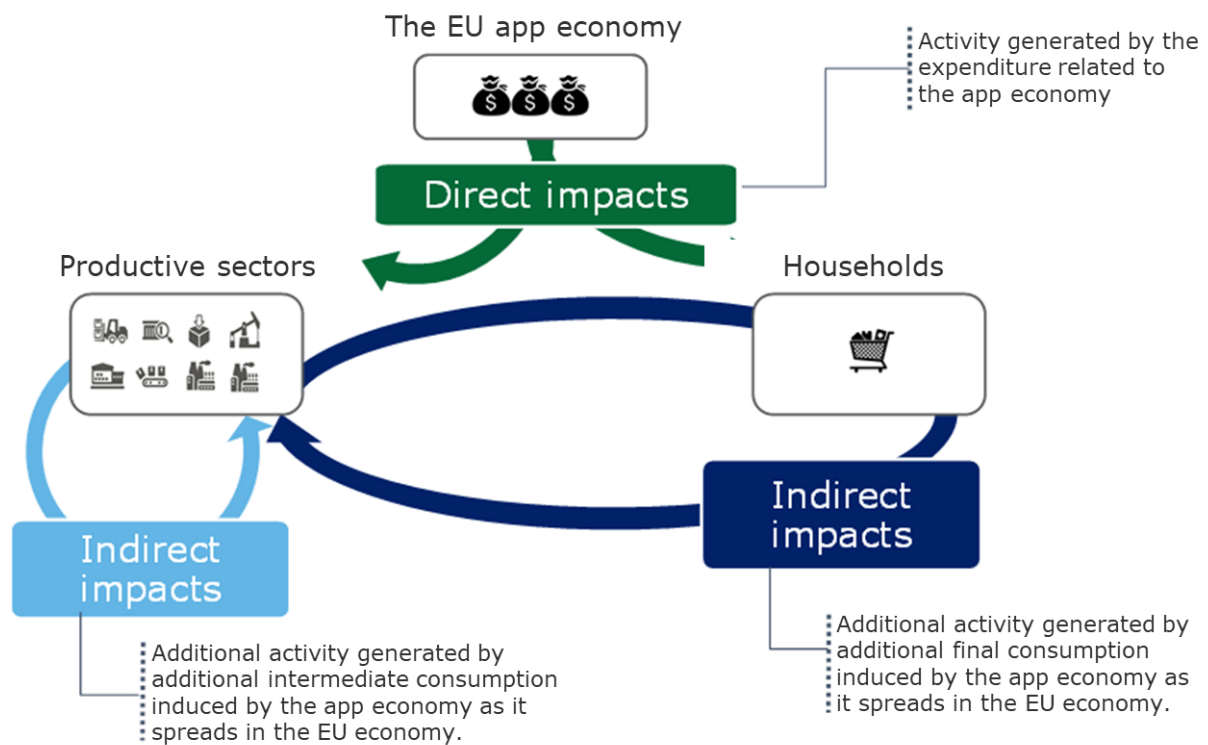
Impact	Revenue generated in the EU economy
Impact on the productive sectors, generated by intermediate consumption by app developers (indirect impact)	€60.9 bn
Impact of households, resulting from consumer spending by people employed in mobile app development companies and their suppliers (induced impact)	€40.2 bn
Total indirect contribution	€101 bn

Source: Deloitte analysis

Methodology

107. Indirect impacts are estimated using an Input-Output model. The model enables us to assess the additional value introduced by the app economy in the other sectors of the EU economy (beyond the sector where the direct revenue is generated). We consider the total value (in terms of revenue) of the app economy and estimate the spillovers on the rest of the economy.

Figure 10. Direct and indirect economic impact of the app-ecosystem



Source: Deloitte

108. The Input-Output model is a powerful tool to assess the impact of an industry or an investment project on other sectors of the economy. The general idea is to measure how a sector is integrated into the economy and how the companies in that sector interact within the supply chain. Our model is based on the most recent (2017) Eurostat input-output tables for EU28.

2.3.5 Total economic impact of the mobile app market in the European Union

109. The total impact of the app economy in the European Union is estimated at €187.2 billion. The following diagram summarizes the economic impact of the mobile app market in the EU.

Table 6. Impact of the app economy in the European Union (2019)

	Details	Revenue
Direct contribution	<ul style="list-style-type: none"> • €5.7 bn in revenue generated on app stores • €23.3 bn from in-app advertising • €55.6 bn from contract work • €1.6 bn net contribution from sales made on mobile apps 	€86.2 bn
Indirect impact	<ul style="list-style-type: none"> • € 60.9 from impacts on the productive sector • € 40.2 from impact on households 	€101.1 bn
Total economic impact		€187.2 bn

Source: Deloitte analysis

The total economic impact of the mobile app market in 2019, including in-app ads and the net contribution of online sales generated on mobile apps, represents €187.2€ billion in revenue, throughout all sectors of the EU economy.

This is equivalent to 0.4% of EU gross domestic product in 2019.

2.4 The app economy and job creation in the European Union

2.4.1 The diversity of jobs created by the app economy

110. App development companies range in size, from entrepreneurs working from home in teams of a few people, to large software and media companies, marketing groups, etc.

111. The types of jobs generated by the app economy are similarly diverse. Core app economy jobs include technical jobs: programmers whose work requires knowledge of mobile applications, security engineers keeping mobile apps safe from being hacked, and help-desk staff who support the use of mobile apps. In addition, employment is created as support to core app economy jobs: marketing, sales, human resources, etc.

2.4.2 Total number of jobs generated

112. We estimate the total number of jobs generated throughout all sectors of the economy at 1.3 million to 1.7 million. Both figures have been obtained by different methods. The lower figure results from our analysis, which consists of identifying total revenue for the sector combined with national accounts data; the higher number is obtained by counting relevant job ads⁸⁹. These figures include direct jobs (software developers, mobile app specialists), indirect jobs (suppliers to the app developers) and induced jobs (jobs created by the spending of the direct and indirect jobs).

- **Direct jobs:**
 - Mobile app specialists: these are IT-positions occupied by qualified employees, including mobile app development, maintenance, and support.
 - Support roles within companies employing mobile app developers: jobs consisting of management teams, human resources, marketing, sales, etc.
- **Indirect jobs:** jobs created by the procurement relationships of app development firms, including positions in security, catering and cleaning services, and office utility supply⁹¹.
- **Induced jobs:** jobs supported by the spending of wages from direct and indirect jobs. People directly or indirectly employed by the app sector gain wages which are spent on taxes, savings and consumption. Based on an estimate of the share of wages consumed, the number of induced jobs is deduced.

113. The number of direct jobs is based on Eurostat data on sectoral output and employment from which we deduce that 6.3 people are employed for every €1 million output in the Programming and Software sector⁹⁰. From the estimated €84.6 billion direct revenues for the app sector, follows that app development supports 524 200 direct app economy jobs. The number of indirect and induced jobs supported by the app-economy has been estimated using the input-output model presented in section 0. Furthermore, supplier relationships and consumption induced by the wages of direct and indirect jobs, support an additional 783 000 (cf. Table 7), resulting in a total of 1.3 million jobs supported by demand for app development.

Table 7. Jobs generated by the app economy in the European Union (2019)

Details		Thousands of people employed
Direct jobs	• <i>IT positions and support roles within app-development companies.</i>	524
Indirect jobs	• <i>Jobs at the companies supplying app companies</i>	454
Induced jobs	• <i>Jobs supported by the spending of those directly and indirectly employed by the app economy.</i>	329
Total number of supported jobs		1 308

Source: Deloitte analysis

⁸⁹ Thelle M. H. et al (2017)

⁹⁰ NACE sector J62-63, "Computer programming, consultancy, and information service activities".

114. To put our estimation of employment in the app sector into perspective, a study by the Progressive Policy Institute (PPI) provides a higher estimate. In 2019, they obtain – via an altogether different methodology that consists of counting job ads with relevant keywords – an estimate of the number of direct jobs in the European Union’s app economy of 672 000⁹¹. This figure is 28% higher than our own. Table 8 summarizes PPI’s results for 2016 up till 2019. The number of direct app economy jobs increased by close to 3% in 2019 and on average by 8% since 2016.

Table 8. Estimates of the number of jobs created by the app economy in the EU, 2016-2019, by the PPI

	July 2019	April 2018	January 2017	January 2016
Direct jobs (thousands)	672	650	600	520
YoY growth	2.9%	8.9%	14.7%	

Source: The Apps Economy in Europe: leading Countries and Cities, PPI, 2017 and update 2019

115. Considering that the two methodologies are very different and independent, the results give credibility to the range defined by the estimates. The reason for our more conservative estimate of the number of direct jobs is possibly found in the prudent methodology used to identify all revenue sources, particularly of the volume of revenue gained by developer firms through subcontracting. This figure is obtained based on a 2013 survey by Gigaom and extrapolated with a strong hypothesis on the growth rate of the sector (section 2.3.2). A sensitivity analysis can be conducted on this figure. If enterprise demand for apps grew 5 or 10 percentage points (p.p.) faster than consumer demand for apps, our estimate of total number of jobs supported by the app economy reaches respectively 1.5 million and 1.8 million.

116. Using our IO-model to add indirect and induced jobs to PPI’s estimate of direct employment, results in a total of 1.7 million jobs supported by the app economy in 2019⁹². This figure represents an app intensity – defined as app economy jobs as a percentage of all jobs – of 0.54%⁹³. In 2019, four European countries presented an app intensity of 1.5% or higher: Denmark, Finland, The Netherlands and Sweden.

The number of jobs supported in 2019 by the European app economy is at least 1.3 million and possibly up to 1.7 million, direct, indirect and induced jobs combined.

⁹¹ The Progressive Policy Institute estimates that the European App Economy totals 2.1 million jobs in July 2019, encompassing direct, indirect and induced jobs, for 30 countries, including Norway and Switzerland. These results are based on the identification of online job postings which contain “iOS” or “Android” or “Blackberry” or “Windows Phone” or “Windows Mobile” or “app”. The number obtained is calibrated against national accounts data. Based on the employment multipliers specified in their paper, and by only retaining EU28 countries as geographical scope, we obtain the figure of 672 000 direct jobs.

⁹² This figure is lower than PPI’s estimate of 2 million for EU28 for the total number of jobs supported by the app economy. The reason for this and the used methodology are detailed in appendix 5.3.

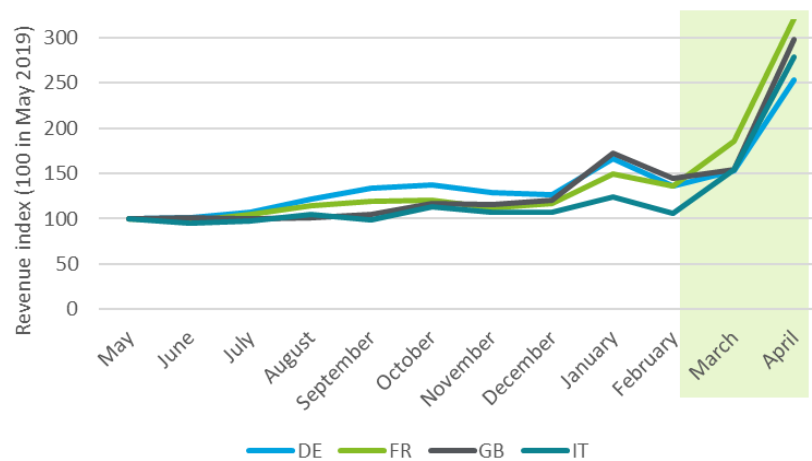
⁹³ Sources: Eurostat (total employment) and own analysis (app economy jobs).

2.5 Impact of the public COVID-19 crisis on the app economy

117. Worldwide, it is estimated that the COVID-19 crisis will have a limited impact on app platforms. Taking into account the effects of the crisis, SensorTower projects revenues generated through app platforms to increase by 20% in 2020, which is only one percentage point lower than their initial projection⁹⁴. The sector shows considerable resilience.

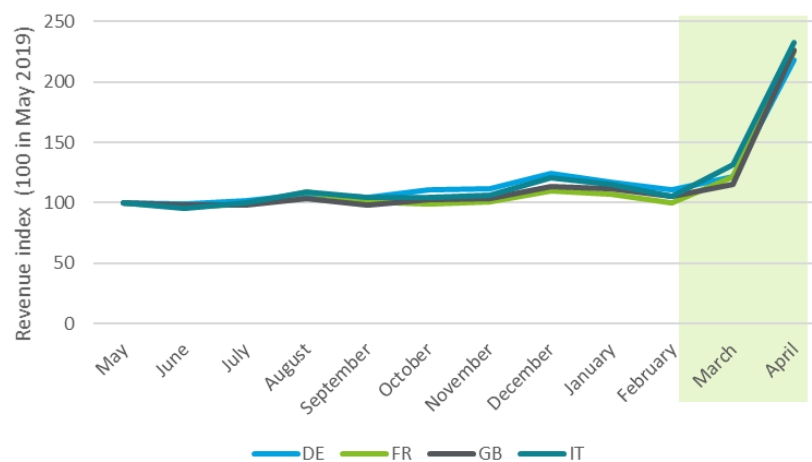
118. Moreover, some app categories saw their revenues increase significantly during the crisis. Monthly health and fitness app revenues were three times as high in April 2020 than on average over the previous year (Figure 11). Mobile game revenues were twice as high in April 2020 than the monthly average over previous months (Figure 12). Educational apps also saw a significant increase in monthly revenues in April 2020 (Figure 13).

Figure 11. Health and fitness app revenues, Google Play and Apple store, May 2019 – April 2020



Source: SensorTower

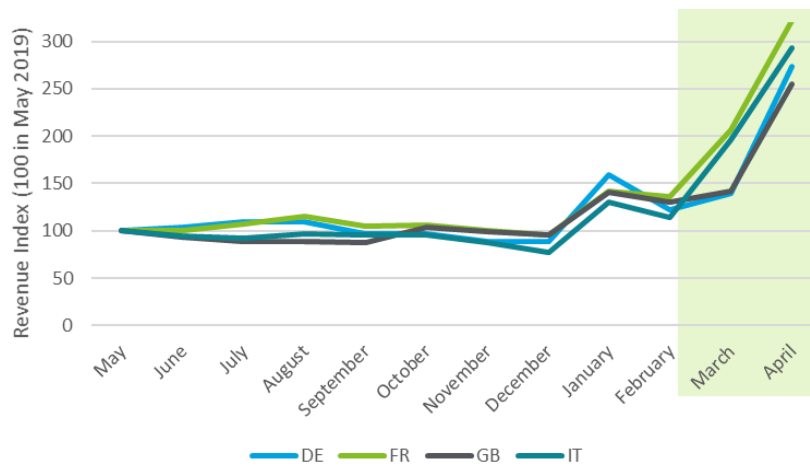
Figure 12. Mobile game revenues, Google Play and App store, May 2019 – April 2020



Source: SensorTower

⁹⁴ <https://sensortower.com/blog/sensor-tower-app-market-forecast-2024>

Figure 13. Educational app revenues, Google play and Apple store, May 2019 – April 2020



Source: SensorTower

119. At the end of March 2020, Codin’Game conducted a survey of 2700 developers worldwide on the impact of the COVID-19 pandemic. At the time of the survey, 87% of the respondents were still full-time employed. Temporary company closures concerned only 1.3% of developers⁹⁵.

120. This overall positive situation is partly explained by the fact that developers are well positioned to provide innovative solutions responding to the crisis. In an interview, the Italian app developer Synesthesia noted that many actors in industries affected by the crisis turned to developers in order to find solutions: “We saw a rise in the interest in mobile app during the emergency”. Some industries are expected to be permanently changed, and mobile apps are expected to play an important role in providing new solutions.

⁹⁵ Codin’Game (2020)

3 Mobile apps will shape the economy of tomorrow

121. Section 3 analyses innovative apps and the future of the European app economy. In the first two sections, we describe how apps have permeated business models: on the one hand many firms incorporate apps into the way they used to provide services to their clients (3.1). In addition, pure players emerged, which are firms that have built their activity on an app (3.2). Finally, we look at the future of the app economy, including an exploration of the future of the sector through the lens of developers (3.3).

3.1 Success stories of firms that integrated apps into their business model

122. As smartphone penetration increases, a strong presence on mobile phones has become increasingly important for many companies. Companies whose core-business is unrelated to the app-economy, adapt to the digital mobile trend by introducing apps to propose their services and goods to consumers. They also use mobile apps as internal business tools. This process is observed among all branches.

3.1.1 Medical sector

123. The use of mobile devices by health care professionals (HCPs) has transformed many aspects of clinical practice in Europe. Mobile devices have become commonplace in health care settings, leading to the rapid growth in the development of medical apps. **Numerous apps are now available to assist HCPs with essential tasks**, such as information and time management, electronic prescribing, access to medical textbooks and drug reference guides, patient management and monitoring, clinical decision-making, and medical education and training⁹⁶.

VIDAL Mobile

124. Vidal was founded in France in 1911, and its first book, a dictionary of pharmaceutical specialty, was published in 1914. For almost a century, the company's revenues were generated by book sales⁹⁷. Vidal launched its mobile app "VIDAL Mobile" in 2010 (for iPhone) and in 2011 (for Android, Blackberry)⁹⁸.

125. The app is restricted to healthcare professionals: they need to authenticate when they first use the app. The app helps health professionals with the diagnoses of a disease based on symptoms and gives them easy access to information on pharmaceutical drugs.

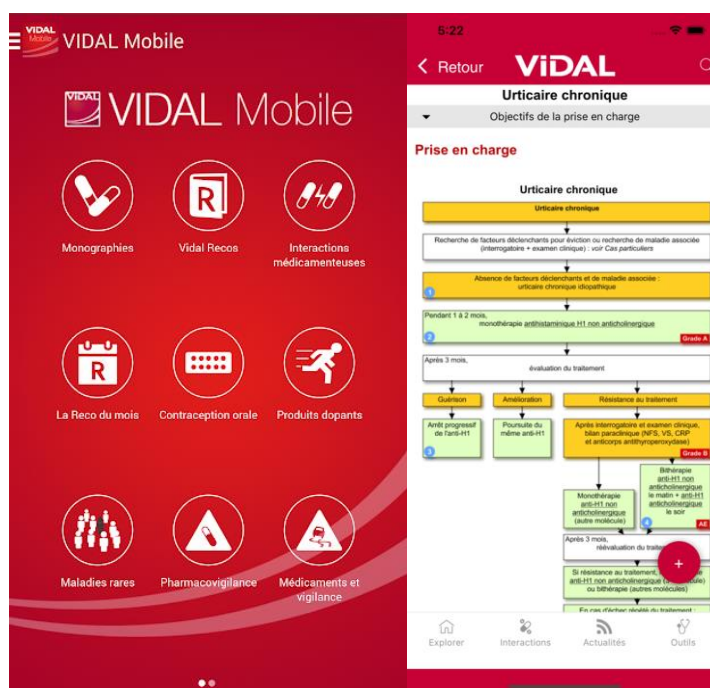
126. In 2019, the app was used by more than 100 000 health care professionals and hospitals across Europe and generated a revenue of about €250 000 through subscriptions.

⁹⁶ Mobile Devices and Apps for Health Care Professionals: Uses and Benefits, C. Lee Ventola, 2014

⁹⁷ The firm also developed a CD-ROM in 1989 and websites in 1999.

⁹⁸ <http://www.vidalfrance.com/societe/histoire/>

Figure 14. VIDAL Mobile's app interface



Source: Apple Store

127. **Mobile phone characteristics⁹⁹ and app convenience explain why apps are adopted even in traditional activities such as medicine.** Health practitioners can always have their phones at hand, contrary to books. Also, searching for treatment and dosage is easier and quicker with an app. The app contributes to improving patient care efficiency.

3.1.2 Airline and Railway companies

128. Most European railway companies were created in the first half of the 19th century. Transport is the second item in European household expenditures¹⁰⁰. In 2018, rail passenger transport in the EU was estimated at 472 billion passenger-kilometers, a 10% growth from 2013. During the same year, 1.1 billion Europeans traveled by air¹⁰¹.

129. In a world where mobility plays a crucial role in people's lives, **most railway and airline companies respond to travelers' needs by providing basic features in their mobile app.** These apps make the booking and travelling process easier: users can book flights and trains anywhere and at any time. Apps also enable users to easily obtain up-to-date information on delays or gates, to exchange or cancel tickets, etc. and thanks to mobile passes, travelers can have their boarding pass at hand.

130. If most transport companies nowadays propose a mobile app, some apps, such as Lufthansa and Oui.SNCF, stand out by adopting new technologies to offer new user experiences.

⁹⁹ Small handheld device

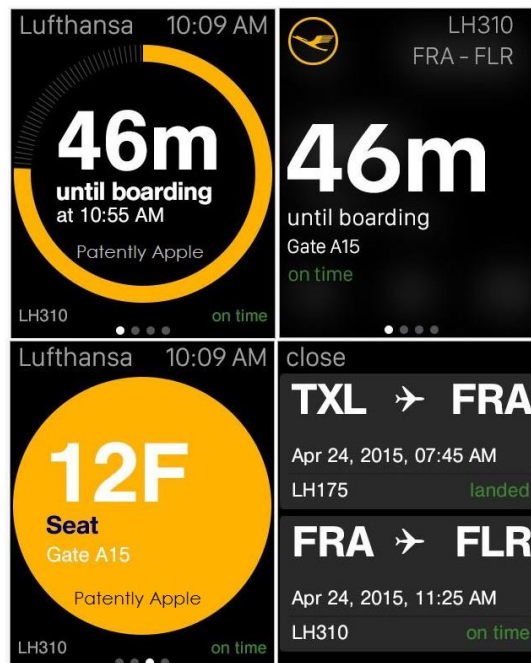
¹⁰⁰ https://ec.europa.eu/eurostat/statistics-explained/index.php/Household_consumption_by_purpose#Evolution_of_shares_over_time

¹⁰¹ https://ec.europa.eu/eurostat/statistics-explained/index.php/Air_transport_statistics

Lufthansa: integration of new technologies

131. Lufthansa (the German national airline company) launched its mobile app in 2012. In February 2020, it counted a total of 20 million downloads and 350 000 monthly active users. New features are continuously added, with the goal of “Rethinking air travel”.
132. The Lufthansa app goes beyond traditional services offered by airline apps, such as booking tickets, mobile boarding passes and instantaneous updates. The app’s success is explained by technological innovations, offering travelers a differentiated and convenient experience.
133. Lufthansa was one of the first airline companies to propose a passport and credit card scan option on its mobile app, in 2015. Customers booking flights on the Lufthansa app can scan their payment cards and passport with their smartphone’s camera: the relevant information is automatically extracted. Using the scan option reduces the average mobile check-in time from about two minutes to twenty seconds¹⁰².
134. **Services permitted by the internet of things (IoT) were integrated early on.** Since 2015, users can synchronize the mobile app with their smartwatches. This option allows users to keep an eye on all the important information about their Lufthansa flight at all times.

Figure 15. Lufthansa’s mobile app Apple Watch interface



Source: Source: patentlyapple

¹⁰² This figure is obtained from another app with similar functionalities.
<https://www.businesstraveller.com/news/2016/02/23/easyjet-app-upgraded-for-credit-card-scanning/>

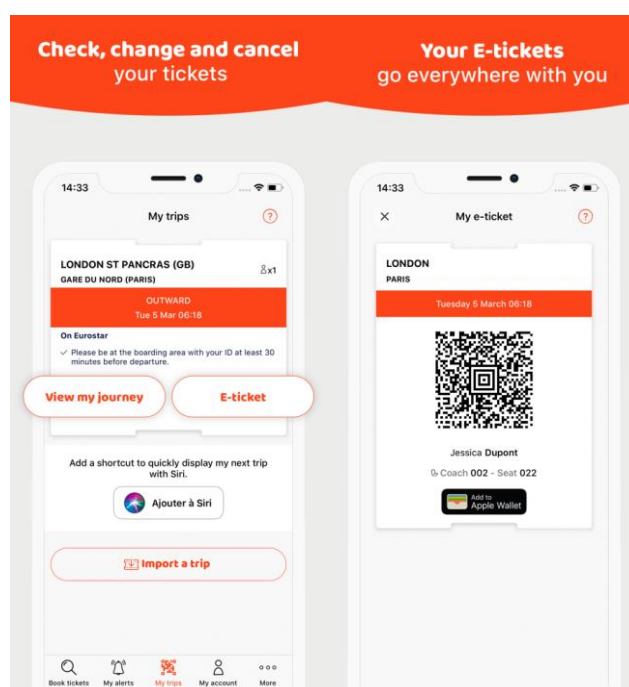
135. In 2019, the Lufthansa app has added a new option which allows to directly access flight information by voice command, without opening the app. This function is based on the Siri Shortcut technology launched by Apple in 2018, which allows to deliver information from apps to Siri. Thanks to a short voice command, such as "Hey Siri, my flight", users get all the flight information from the intelligent assistant: the time needed to get to the airport, the boarding gate, etc.

Oui.sncf: simplifying the travel process

136. The app proposed by the French railway company SNCF is a great example of how to meet consumers' expectations with innovative options. SNCF launched its mobile app in 2009. The Oui.sncf app has been downloaded more than 18 million times and has more than 1.5 million monthly active users. It is frequently ranked as the number one travel app in France. **In 2018, the firm announced that more sales had been achieved through the app than through its website**⁶⁴.

137. **The app makes the whole travel process simpler.** When users perform a search, their recent trip searches are shown, and thanks to Artificial Intelligence (AI) the app proposes trips that are more likely to be booked. Also, the Low Price Alert¹⁰³ option has been very successful since its launch in 2017. App users can enter the destination and the travel date of their interest, and they will receive a notification on their mobile phone when the price is low. In 2018, this option has led to more than 2.4 million notifications. The app thus proposes a new booking process: users can book tickets everywhere, at any time, with an intelligent platform. In addition, the tickets are available as QR code.

Figure 16. Oui.sncf's app interface



Source: Apple Store

¹⁰³ Alerte Petits Prix. This option is also available via SNCF website: an e-mail will be sent when a given trip is available. However, when using this option through the app, users can book their train as soon as it is available.

3.1.3 Shopping

138. With M-commerce revenues reaching an estimated €394 billion in Europe in 2019, mobile apps became an integral part of retailers' business model. Traditional brands acknowledged that apps are tools for increasing sales. While many retailers offer a basic app as an additional distribution channel, **other retailers offer users a renewed shopping experience.**

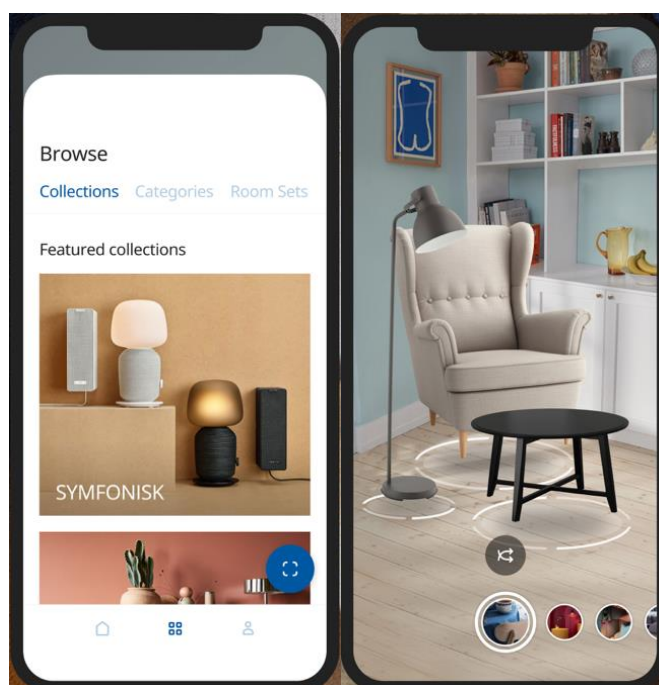
Ikea Place: AR technology supporting shoppers' purchasing decision

139. Ikea is a Swedish company founded in 1943 that designs and sells ready-to-assemble furniture, kitchen appliances, and home accessories. Realizing that consumers were ditching showrooms for online shopping, the company decided to develop three **apps enhancing the shopping experience**: an in-store app that helps to collect barcodes, an Ikea catalog app, and an augmented reality app to preview furniture in the customer's room.

140. This last app, Ikea Place, was launched in 2017 and has been downloaded 3.7 million times since. Ikea Place had more than 370,000 monthly active users worldwide on iPhones in February 2018¹⁰⁴. **This app demonstrates AR's potential to create valuable user experiences by solving practical problems.**

141. **IKEA Place lets shoppers virtually place true-to-scale 3D models in their own home**¹⁰⁵. Consumers can use the augmented-reality feature to visualize the furniture in their house before buying. The last version of the app also features Visual Search, allowing users to take a photo of any piece of furniture they fancy, then find similar or identical Ikea products through the app.

Figure 17. Ikea Place's interface



Source: Apple Store

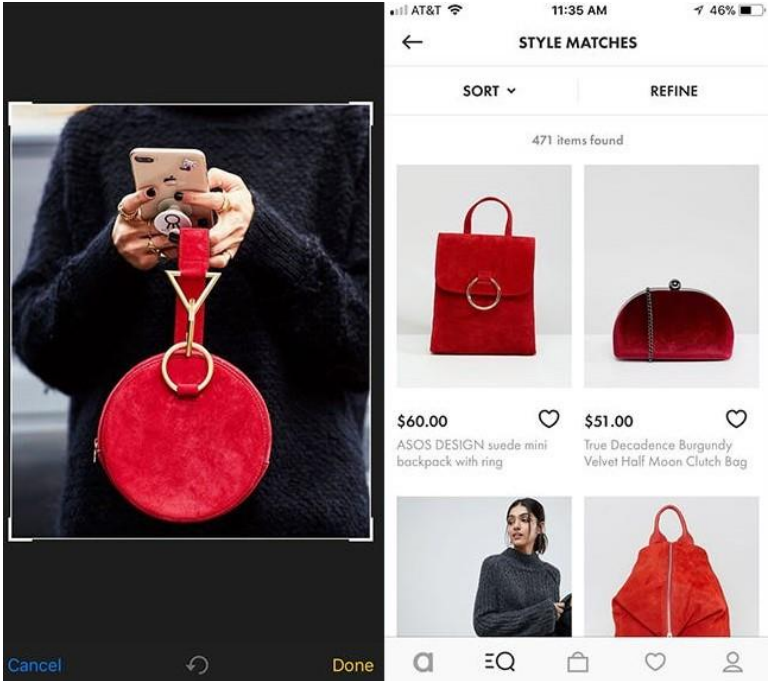
¹⁰⁴ According to App Annie

¹⁰⁵ App description in Apple Store

Asos: Visual Search technology to help shoppers choose

- 142. Asos was created in 2000 in the United Kingdom as an online clothing retailer. However, with the increasing mobile-phone penetration rate and m-commerce spending, the firm soon understood the importance of developing a mobile app. Today, 70% of Asos’ traffic and 58% of purchases happen on mobile¹⁰⁶.
- 143. The company developed its built in-house app, which was released in 2011 in the UK and in 2014 worldwide. The app has more than 50 million downloads in total and 5 million monthly active users in 2019.
- 144. The firm’s willingness is to “build experiences that capitalize on mobile”¹⁰⁷. In line with that idea, the app proposes, since 2017¹⁰⁸, a **Visual Search tool: the Style Match option**. This option is valuable for users since shoppers can take an in-app photo of a product they like, and, thanks to both **data learning and intelligent digital image processing technologies**, the app pulls similar items from a pool of 85,000 product images. This option responds to an issue that users are facing when doing online shopping: they face a dense and hard-to-digest range of products. This tool will help narrowing down the product range and **getting customers straight to the products they’re looking for**.

Figure 18. Asos’ Visual Search option



Source: businessinsider

¹⁰⁶ <https://digiday.com/marketing/asos-gets-50-percent-customers-buy-mobile/>
¹⁰⁷ Rich Jones, Asos’s head of product
¹⁰⁸ 2017 for the UK and 2018 Worldwide

3.2 Pure Players

145. The novelty and the intrinsic features of the smartphone allow anyone with a good idea to propose a unique service and experience by launching an app. When the App Store was created in 2008, there were 5 000 apps launched the first year. Five years later, there were more than 730 000 apps available in both stores. In this section some examples of pure players are discussed in popular categories: health and lifestyle, travel and games.

3.2.1 Health and lifestyle

146. Health¹⁰⁹ and lifestyle¹¹⁰ mobile apps aim to make their users' lives easier. These categories of apps are growing fast. Lifestyle apps have a penetration rate of 65%¹¹¹ among Android users, and mobile health apps are expected to increase steadily with wearable device adoption. Smartphone features facilitate the recording of health data. Moreover, the camera of mobile devices allows for an interaction between app functionalities, the user and its environment, which provides a basis for innovative services.

Yuka

147. **Yuka gives users the possibility to scan food and cosmetic products and analyzes their impact on health.** The French app was launched in January 2017, after Yuka's developers won the 2016 Food Hackathon, a startup competition, allowing them to benefit from a year of support in their development.

148. In February 2020, Yuka counted 16 million users. In total, five million products are scanned every day, which means that on average, 55 products are scanned per second.

Figure 19. Yuka's interface



Source: Yuka, 2020

¹⁰⁹ Health apps are only for users, while m-health solutions improve the collaboration between patients and healthcare professionals.

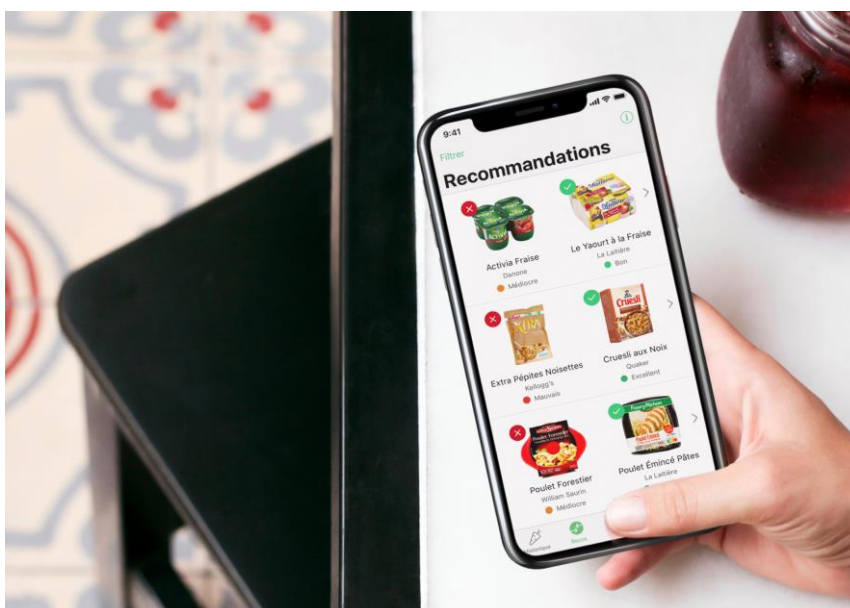
¹¹⁰ Some of the lifestyle apps include: Fitness apps, Food & Drink apps, Dating apps, Music apps, Fashions apps, news, etc.

¹¹¹ <https://www.statista.com/statistics/200855/favourite-smartphone-app-categories-by-share-of-smartphone-users/>

149. The app has 3 main features:

- It evaluates the quality of food according to nutritional quality and the presence of food additives.
- Since June 2018, Yuka also checks the quality of cosmetics according to the presence of allergens, carcinogenic compounds, endocrine disruptors or irritant products.
- For mediocre or bad products that a user has scanned, Yuka independently recommends more healthy alternatives.

Figure 20. Yuka's recommendations of alternative products



Source: Yuka, 2020

150. Yuka's success is dependent on the product database. Currently, it contains 1.5 million food and 500 000 cosmetic references. About 2 000 new products are added to the database daily.

151. Yuka has an impact on consumer behaviors and on companies:

- 92% of users do not buy the scanned products when it is rated red on the app;
- 21 food and cosmetic companies said that Yuka has impacted the composition of their own products¹¹².

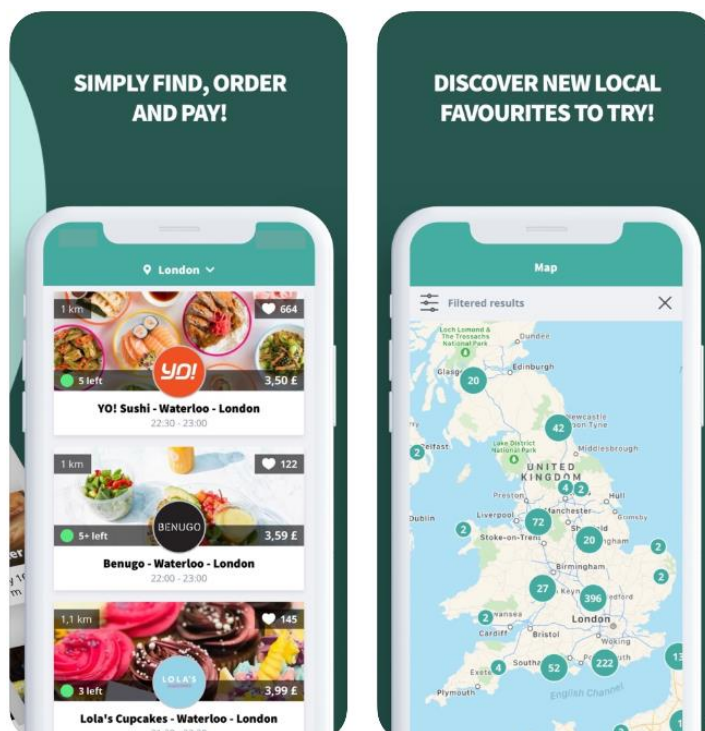
Too Good To Go

152. Too Good to Go was created to enable everyone to fight against food waste at their own level. Food sellers can offer unsold items that would otherwise be wasted. Consumers can obtain food at a reduced price. The app was launched in 2016 in France and is now available in 11 European countries. It was downloaded 20 million times since its launch and had 700 000 monthly users in 2019.

¹¹² These companies include Nestlé France, Monoprix, Garancia, Unilever, Caudalie, Leclerc, Fleury Michon and Intermarché.

153. More than 44 000¹¹³ food businesses are registered on the app, such as bakeries, supermarkets, restaurants and hotels. Many food leaders joined the platform to propose their unsold items¹¹⁴. Around 25 000 meals are sold every day.

Figure 21. Too Good To Go's interface



Source: Apple Store

154. The strategy of the app can be qualified as a Win-Win-Win¹¹⁵ strategy. Too Good To Go's success is based on matching the needs of consumers, producers and the planet. **Both producers and consumers take part in an environmental effort by using the app. The app's success is linked to its environmental commitment**, aligned with current mindset change. When developing Too Good To Go, Lucie Basch, the Too Good To Go founder, understood that **apps can be activist**.

Figure 22. Too Good To Go's environmental commitment



*Each meal saves the planet from 2.5Kg of CO2.
Calculation source: The EPA - United States Environmental Protection Agency.

Source: Too Good To Go, 2020

¹¹³ <https://toogoodtogo.co.uk/en-gb/business>

¹¹⁴ Examples include Casino (FR), Carrefour (FR), Auchan (FR), Edeka (GR), Spar (NZ) and Starbucks (US).

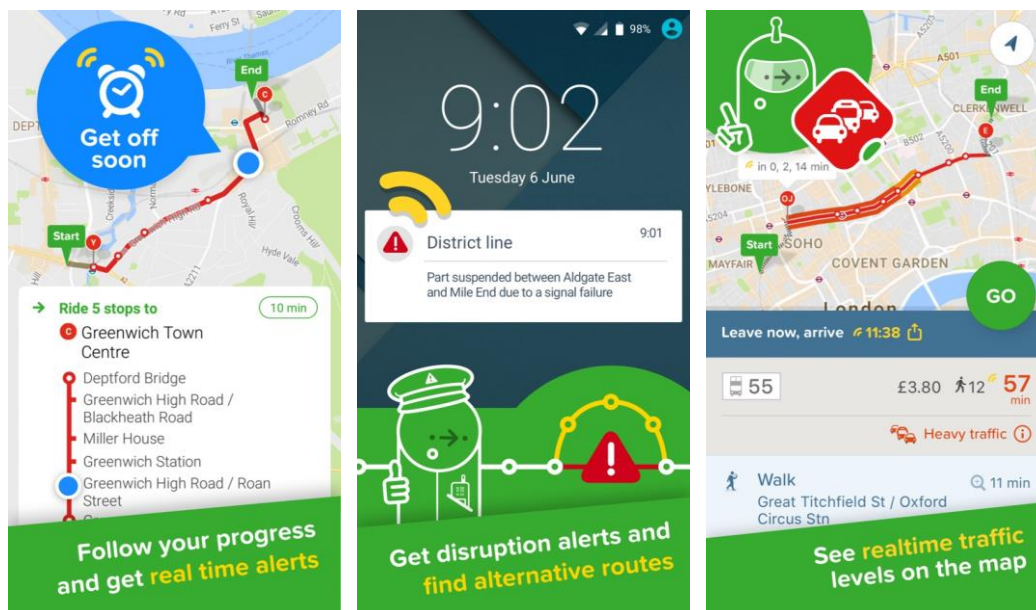
¹¹⁵ Business, consumers and planet benefit reducing food waste

3.2.2 Travel

Citymapper

155. Citymapper is an example of the innovative solutions in the field of travel and route calculations that are enabled by the geo-localization feature of mobile devices.
156. Citymapper is a mobile app for urban route calculations. The start-up was created in London in 2011. The app calculates, in real time, the routes of urban transport users, by combining several modes of transport. It considers both public transport networks, taxi and private hire, such as self-service rental networks, from scooters to bicycles¹¹⁶.
157. **In January 2020, Citymapper was active in 41 cities worldwide** including Amsterdam, Berlin, London, Madrid, and New York, Paris, Rome, Tokyo and Vienna, and headquarters are based in London.
158. **The app offers many innovative features.** Citymapper indicates to the user where to board the train in order to be close to the exit when leaving the train and suggests the best entrance to get quickly to the platform. Citymapper also has a live service alert concerning disruptions and offers alternative routes taking them into account. It also indicates availability of bikes and docks at nearby locations.
159. Its success led the app to innovate beyond the app ecosystem. Citymapper has created a “Citymapper Pass”, a subscription to all transport modes available in London. This new pass integrates ticketing and payment and allows the user to avoid queues. Citymapper aims to extend this pass to other cities. Hence, with a single subscription, users would be able to travel easily everywhere.

Figure 23. Services offered by Citymapper



Source: Citymapper

¹¹⁶ In London, Citymapper includes Bus, Santander, beryl, JUMP, Mobike, Tube, Train, Turo, Zipcar Flex, Virtuo, Getaround, Ola, Kapten, Uber, Black Cab, FREE NOW, Ferry, Tram and on foot.

3.2.3 Games

160. Of all the mobile apps available on the app platforms, the most popular category is gaming. Nearly 25%¹¹⁷ of all mobile apps fall into this category.

161. **Mobile has helped broaden the age range of gamers:** most time spent in mobile games is by people over 25, who do not identify themselves as gamers¹¹⁸. Europe groups many successful mobile game developer companies.

Supercell: Clash of Clans

162. Supercell is a Finish mobile game development company founded in 2010. The company has released five mobile games which are freemium fast-paced games¹¹⁹. Supercell's games have been downloaded 1.8 billion times and in 2019, the company's revenues topped €1.4 billion¹²⁰.

163. The firm's strategy relies on developing long-lasting games. More than 8 years after it was launched, Clash of Clans still has 36 million monthly active users in 2020. The firm managed to keep players using their app: the app never had less than 19 million monthly active users. This success is explained by app store and smartphone specificities:

- Games are **community-based**: players join teams and fight against other teams. The app platforms offer visibility to the game and allow players to battle against million players worldwide.
- **Adaption to user behavior**: most smartphone apps are opened for less than 3 minutes. Clash of Clans and Clash Royale apps are adapted to this behavior. To upgrade levels, **players must play several times during the day, for small intervals.**

Playgendary and Voodoo

164. Even though mobile games are very popular, app usage analysis reveals that users often download an app and use it for a very short period of time: the user retention rate of mobile applications worldwide was 32%¹²¹ in 2019.

165. With this in mind, some game developers choose a strategy to keep users playing their games: develop multiple small games. Once players are bored with one game, they can download another game of the company.

166. Playgendary, founded in Germany in 2016 and Voodoo, founded in France in 2013¹²², have both based their strategy on developing multiple hyper-casual games¹²³. Voodoo has more than 90 mobile games available on the major app platforms, of which 12 were released in the last three months. Playgendary has a total of 69 apps available. The firms' success relies on developing games that attracts many users, even if is only for a short period of time. Both developers constantly have games in the top 10 games.

¹¹⁷ Statista, Most popular Apple App Store categories by share of available apps, 2019

¹¹⁸ App Annie, State of Mobile: 2019 and beyond, 2019

¹¹⁹ Hay Day, Clash of Clans, Boom Beach, Clash Royale, and Brawl Stars

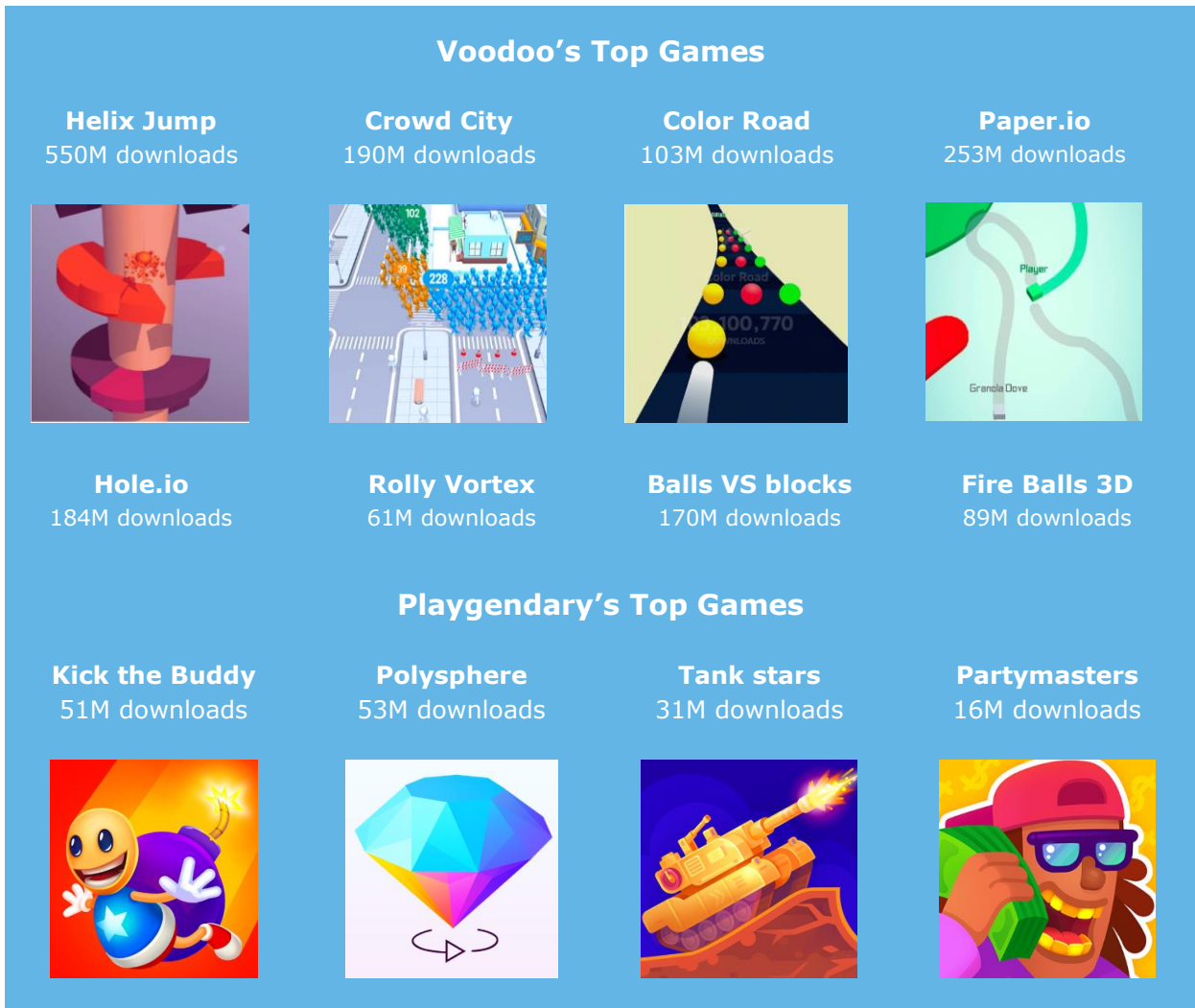
¹²⁰ Statista, 2020

¹²¹ Percentage of users that returned to an application 11 times and more.

¹²² In 2019, Playgendary had a total of 1.2 billion downloads, and €53 million revenues while Voodoo had 2.9 billion downloads and €6.0 million in revenue. Voodoo and Playgendary respectively have 1 billion and 500 million individual players worldwide.

¹²³ Hyper-casual games are games that have simple tap-to-play mechanics and offer instant gameplay. They don't take much of users' time and can be played while multitasking.

Figure 24. Voodoo's and Playgendary's top Games by number of downloads



Source: SensorTower

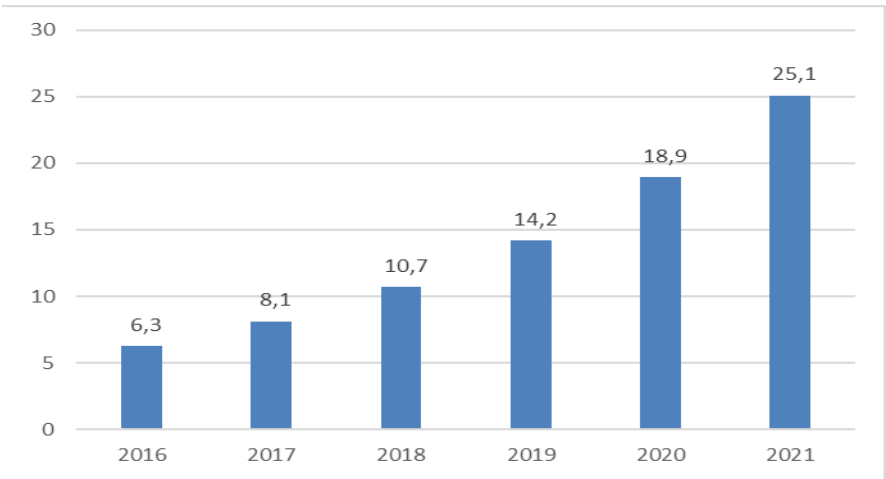
3.3 Seizing mobile apps' potential: technologies and companies of tomorrow

3.3.1 Apps of the future

IoT and connected devices

167. The internet of things¹²⁴ (IoT) refers to a vast network of connected devices that share and exploit many different types of data. **Mobile apps play a fundamental role in the IoT: they constitute the interface enabling users to interact with physical connected devices.** Gartner¹²⁵ predicts that, globally, there will be more than 25 billion connected devices by 2021.

Figure 25. Change in the number of connected devices globally (estimates)



Source: Gartner

168. More and more homes will be connected throughout Europe: in 2019, there were 20 million smart homes. This number is expected to exceed 80 million by 2023¹²⁶, or 23% of European households. Hence, smart homes will be a strong driver of the future development of connected devices.

169. A connected home has a network that interconnects multiple devices and sensors. Services range from communications and entertainment to healthcare, security and home automation. Users are connected in real-time with their home, and mobile apps enable them to control and monitor their homes.

Connected devices inside smart-homes can be regrouped into 5 categories: control and connectivity, smart appliances, security, media and entertainment, comfort and lightning and energy management. Table 9 describes the different categories and evaluates their growth in 2023 in terms of number of households equipped with the different connected devices.

¹²⁴ 63. This term includes a wide range of devices connected via mobile apps ranging from household appliances, to cars, and even buildings forming a concept widely referred to as smart cities.

¹²⁵ Gartner is the world's leading IT research and consultancy firm. Gartner regularly publishes sector analysis of the IT market. Gartner advises more than 12,000 companies all over the world. The company employs more than 8,000 people in 85 countries and in 2016 Gartner generated €2.2 billion in revenue.

¹²⁶ Berg Insight (2019)

Table 9. European households (in million) equipped with connected devices, by categories of connected devices

Category	Description	2018	2023
Control and Connectivity	The segment includes smart speakers, central control and communication units, programmable control buttons, and smart plugs for the control of non-smart devices.	21	57
		<i>Growth: 173%</i>	
Smart appliances	This includes connected versions of all kinds of household appliances, provided they are connected to the internet.	9	27
		<i>Growth: 198%</i>	
Security	The Security segment includes surveillance products as well as equipment for risk monitoring	11	31
		<i>Growth: 185%</i>	
Home entertainment	The Home Entertainment segment comprises the sale of products and services for multi-room entertainment as well as connected remote controls and streaming devices.	16	41
		<i>Growth: 157%</i>	
Comfort and Lighting	The Smart Home segment Comfort and Lighting includes devices for the improvement of the living atmosphere.	14	40
		<i>Growth: 185%</i>	
Energy management¹²⁷	The Energy Management segment covers the sale of products and services for the control and reduction of energy consumption.	12	41
		<i>Growth: 237%</i>	

Source: Smart Home Report (2019), Statista

Enterprise mobile applications and Enterprise mobility management

170. Enterprise mobility management (EMM) apps enable ubiquitous access to tools and processes for workers. The rise of EMM goes hand in hand with the allover rise of the use of smartphones. The modern workforce becomes more and more mobile and firms thus increasingly use mobile devices: **60% of employees use apps for work-related activities¹²⁸**.

171. Moreover, enterprise mobile apps are designed to improve business and employee efficiency. For example, mobile access to emails has been shown to increase labor productivity¹²⁹. Employees perform work-related tasks on mobile devices during transport time, which increases the total time employees spend working¹³⁰.

172. EMM is a growing industry. Many companies plan to adapt by offering new/additional mobile apps: 87% of companies plan to expand their app portfolio¹³¹. Revenues are expected to grow from €5.8 billion in 2017 to €13.8 billion in 2021¹³².

¹²⁷ This category is still mainly linked with smart cities, but consumers are progressively proposed devices and apps allowing them to track, control and monitor their gas/electricity consumption.

¹²⁸ Digital Strategy consulting, (2014)

¹²⁹ Bertschek, I. and Niebel, T. (2015)

¹³⁰ iPass, 2011

¹³¹ Apprian (2016)

¹³² 451 Research report, 2017

3.3.2 Developers' point of view on the future of the app sector

173. Interviews with several app development actors were conducted. As sector specialists, they shed a light on why and how they innovate, and on the types of innovations to be expected in the future. In addition, because of the timing of this study (February-April 2020), they commented on the impacts of the public health crisis on the app economy.

Innovation in the app sector

"Innovation is something that should be valued, that we should embrace and appreciate in Europe." F. Ronchi, president and CEO of Synesthesia

174. Even though apps already are an "integral part of our life" (F. Ronchi), Stanislas Dewavrin, co-founder and CEO of Oh BiBi, explains why many innovations are still to come:

175. "Aspects of our lives that have not been revolutionized yet are the next frontier, anything that is done the same way for one century is about to change. Consider the way you're exercising your democratic rights for example; do you think the next generation will feel comfortable doing it this way? They're used to a level of communication and interactivity with leaders that has yet to be invented".

176. Over the past years, there have been many hardware innovations for smartphones. According to S. Dewavrin: *"Tech is already great. We have tons of bricks that allow us to create whatever we want"*. Future innovations will come from software combined with the use of big data.

Stanislas Dewavrin, CEO of Oh BiBi: "Innovation is progress, it's a perpetual race towards unlocking competitive advantage in the segment".

177. For app developers, *"Innovation is vital to remain competitive"*, (F. Ronchi). He adds that innovation is important both for developing new solutions for their customers, as well as for increasing the efficiency of the internal work process.

178. In the mobile game industry, innovation is strongly driven by user behavior. An important share of games are hyper-casual games: *"games that can get the attention from anyone out there and which let users play for a short period of time"* as Kristian Nordahl, Senior Vice President Operations at Kiloo, puts it. These games are adapted to the way users interact with a smartphone: the phone is used for short moments, up to 10 minutes, and users go back often to their phone¹³³. K. Nordahl gave an insight into hyper-casual games' importance: *"of the top 10 games today, give and take but we will see half of those being hyper-casual games"*. Users play these games for not more than a year and then pass on to other games. This dynamic drives innovation, as S. Dewavrin says: *"you can expect a lot of innovation [in mobile games] as the cycles are shorter and pressure to understand people in multiple situations is pretty high"*.

¹³³ Source: [Statista](#)

The innovation process

179. App developers transform inventions, which are new technologies or processes, into innovations. Innovation happens when an invention is implemented in marketable products and adopted by consumers and enterprises. Inventions relevant for app developers are big data analysis techniques such as artificial intelligence and virtual and augmented reality. Developers use these inventions to propose innovative apps for consumers. A. Normand, founder of Greenly, illustrates this transformation of invention to innovation. The app's concept is to inform users on the greenhouse gas emissions generated by their consumption pattern, obtained via their bank transactions. For this, detailed databases on emissions for individual brands and products are used. In addition, as he explains, the app *"takes advantage of the consequences of the European Directive DSP2 which obliges banks to make banking information available to third party applications with the consent of users"*.
180. Innovation in app development is a two-way process. On the one hand, new needs and expectations emanate from users: enterprises and consumers. On the other hand, developers are aware of inventions and societal evolutions of which non-specialist end-users might be less aware. As Synesthesia's developers state: *"We have two ways to do research: bottom-up and top-down"*. Bottom-up research is more short-term and consists of *"collecting customer needs and then develop prototypes"* that can be proposed to their clients. The driving idea is to *"identify the gaps in the current technology"*.
181. The top-down process concerns longer-term development of new solutions. In collaboration with startups and research groups at universities, technologies are selected *"that will bring value for example five 5 years from now"*.

F. Ronchi gave an example of top-down innovation: "People in the future will want to know how Artificial Intelligence decisions are made, and to be part of the process. In the future, the non-transparent nature of AI technologies will be less acceptable for users. Developers need to be ready in time."

182. Developers acknowledge the importance of professional networks for the innovation process. For Synesthesia, this network is both academic and business-oriented.
183. **Developers agree on the importance of training and education for app development, encompassing both hard and soft skills.** When asked why European games are successful, K. Nordahl answers: *"Education in the arts and in software development are critical"*. Europe has highly skilled and educated people, that in addition are passionate about what they do. For the hard skills, F. Ronchi says: *"More people get trained in software development in Europe and the quality of education is increasing"*.
184. In development companies, **a stimulating work environment is an important factor for innovation.** Freedom and intrinsic motivation are highly valued: *"what we have are highly-skilled, highly educated people who can think: they have the liberty to think."*, says K. Nordahl. *"My colleagues are passionate: they could be musicians or soccer players. They love [their job], and that affects the creation of the games"*.

Future developments in apps

"Innovation will continue, there are fantastic things to do and many problems to solve." P. Abel, Escapadou

185. **Interviewees agreed on the importance of connected devices for the mobile app sector.** In particular, app development for medical and health-related connected devices will further develop. If connected devices, such as connected watches, are already largely adopted by individuals, professional adoption in the health sector is less advanced. In Europe, *"Doctors are not equipped for remote monitoring with connected objects and applications"* observes A. Normand, who previously worked at Withings. In the future, mobile apps will be used to *"aggregate telemedicine data to identify at-risk patients in heart failure, diabetes, hypertension, etc."*
186. **F. Ronchi identifies digital identity as an area which will further develop.** Many technologies are included in this topic: *"connection with public administrations, healthcare, digital payments, etc."*
187. If mobility and micro-mobility are already important in the mobile app economy, Synesthesia developers predict that **"Mobility is a sector that will continue to grow.** We saw the explosion of electric scooters in cities and of ride-sharing. These services, that are enabled by smartphones and apps, were quickly adopted by users. [...] This segment will continue its expansion."
188. At Synesthesia they press the idea that "a lot of trends we are seeing during [the sanitary crisis] are going to set permanent changes on how people work, study, teach, get distraction and entertain in the future. The digital way is going to be more and more wide-spread and accepted." If revealed true, many mobile app categories will see permanent changes:
- **Education:** During the lockdowns in many countries, education is provided online. However, this evolution, imposed by constraint, reveals that the educational system is not sufficiently prepared for this, which results in inequalities in access. The crisis might accelerate the removal of real or perceived barriers to using apps and online tools for education.
P. Abel (Escapadou) points out why mobile apps are an interesting tool for education: *"apps are not teachers but rather facilitators. Educational apps can guide children and provide them autonomy in their learning process. For small children, using fingers on a tablet is a very intuitive way to interact with a machine."* He also adds that these tools can be effective for children with a handicap, for example for children on the autism spectrum. He specifies that innovation in educational apps will be in terms of *"personalized education"*: the app automatically adapts to the child's level.
 - **Hybrid events:** Due to the sanitary crisis, events go online. This might cause an acceleration of the hybridization of events, *"mixing physical and digital"*. Mobile apps will play a central role in hybrid events: *"For these kinds of events, we need software and mobile apps to let people interact just as if they were going physically to the event"* (Synesthesia).
 - **Health:** the sanitary crisis demonstrates that mobile apps – because of the role they play in data gathering, transmission and consultation – can be very useful for the health and medical sector. In terms of mobile health, *"everything that seemed desirable in the long term a few weeks ago is now a self-evident fact"*, says A. Normand. For example,

apps in conjunction with connected medical devices would facilitate following chronically ill patients, not only during the lockdown, but in general.

- **Micro commerce delivery:** the lockdowns caused a surge in micro-local delivery. Again, this is a case where a trend initiated before the crises is possibly accelerated. Synesthesia developers expect that *“micro-local delivery is going to be a big deal in the future.”*

189. Finally, developers argue that app platforms have a role to play in development of the mobile app sector. As P. Abel says, app platforms offer *“great opportunities, a fantastic medium”* that *“give people the opportunity to develop apps.”* App platforms he says have the responsibility to help users find the right apps: *“For the last ten years, the question has been: how can the user find the right apps? This is a problem that Apple and Google have to address”*. Some app categories struggle to be visible on app stores. A. Normand points out that *“neither Apple nor Android have an environment category on their platform.”* He defends that *“If a central topic of the next few years is the environment, and mobile applications have a major role to play in this, then it is important to have an environment category.”*

“The platforms have enabled a lot of innovation.” P. Abel

What covid-19 crisis reveals about the mobile app sector

190. The public health crisis brought awareness of the importance of apps in everyday life. Apps are used for public use, such as education or information. **Apps went from a nice-to-have product to a must-have product:** *“mobile apps are moving from complementary component to essential components.”* says F. Ronchi. If apps are used for basic purposes, then their use needs to be accessible by everyone: *“the app needs to run on a large variety of devices and to have the maximum level of responsiveness: one needs to think about the bandwidth used for ads.”*¹³⁴

191. Many players prepare for the possibility that the market and mindset will durably change: *“We have been contacted by many players among the most affected industries like tourism, education, event organizers... All these players are very concerned with how this crisis is going to change the market and mindset of people. Some of them think that this is going to permanently change some industries”*, reports F. Ronchi.

192. **In the future, mobile apps can efficiently help preventing and fighting healthcare emergencies:** *“Mobile apps enable a lot of features that can be used to follow up on the health of people and to provide information to the population. The crisis offers an opportunity to solve big problems by using big data in conjunction with mobile apps.”*

¹³⁴ Advertisement takes up about 50% of bandwidth. Source: Shine, Worldwide study (2016)

4 Conclusion

194. The life of Europeans, across consumer and enterprise contexts, has experienced a drastic change through the introduction of mobile apps in society. In this report, the EU app economy was quantified and the increasing presence of apps in all aspects of daily life was discussed, a trend which will continue in the future.

195. Mobile app stores have a positive and important impact on the EU economy. App stores' main role is to connect users to app developers, and in doing so, they create a frictionless environment where users and app developers can interact in a simple and easy manner. Our research underlines several positive impacts of app stores¹³⁵:

- App stores have enabled disintermediation between buyers and developers which is one way through which app stores **reduce transaction costs** for app developers and their users.
- App stores reduce entry barriers for developers and therefore increase the level of competition and innovation.
- App stores increase consumer trust and security by creating a trustworthy platform for users and developers.

196. The direct revenues of the app economy in the European Union¹³⁶ amounted to €86 billion in 2019 – these are revenues for mobile app developers. Including direct and indirect contributions, the app economy generated €187 billion in revenues throughout all sectors of the EU economy. The breakdown of this sum is as follows:

- Direct contributions: €86 billion
 - i. Advertising revenue: €23.3 billion
 - ii. Paid downloads, subscriptions and in-app purchases: € 5.7 billion. Mobile games represented 67% of this revenue.
 - iii. Contract work: €55.6 billion
 - iv. Mobile-commerce: €1.6 billion is attributable to the app sector (for a total of revenue of €394 billion)
- Indirect contribution: €101 billion in indirect contributions due to additional business and household consumption triggered by app development.

In terms of value added, the app economy constituted 0.4% of European GDP in 2019.

197. The total number of jobs generated in 2019 throughout all sectors of the economy by the app sector is estimated between 1.3 million to 1.7 million. Both figures have been estimated by different methods. The lower figure is Deloitte's estimate. Jobs are calculated using our "Input-Output" model (total revenue for the sector combined with national accounts data). The higher number is obtained by the Progressive Policy Institute, counting relevant job ads¹³⁷. These figures include direct jobs (software developers, mobile app specialists), indirect jobs (suppliers

¹³⁵ App stores refer to all app platforms including Google Play store, Apple App Store, Amazon app store, etc.

¹³⁶ Throughout this document, figures are cited for EU28.

¹³⁷ Thelle M. H. et al (2017)

to the app developers) and induced jobs (jobs created by the spending of the directly and indirectly employed workers).

198. The fast growth of consumer spending on apps – Europeans spent 19% more on apps in 2019 than the previous year – shows that **apps increase consumer wellbeing**. Also the importance of M-commerce, which represents now close to half of e-commerce in Europe¹³⁸, attests to the preference of consumers for mobile services. When given the choice, many consumers opt for service provision via apps.
199. Looking at the producer side, we observe how **apps have permeated business models in many ways**: on the one hand many **firms incorporate apps into the way they provide services to their clients**. For example, airline and railways companies make the booking and travel process easier with mobile apps. Some of these apps go beyond offering a mobile distribution channel. For example, in the retail sector, Ikea Place uses augmented reality to allow the user to visualize furniture in his home before purchasing. In addition, **pure players emerged, which are firms that have built their activity on an app**. Well-known examples are ride-hailing apps, which use geo-localization, and mobile games.
200. In interviews conducted for this study, app developers said that **future innovations in apps will not come from hardware developments but from the software side**, such as the further development of the use of big data analysis techniques to combine personal and external data, or augmented reality. Apps will continue to permeate more and more aspects of our lives, in areas such as the Internet of Things (IoT), mobility, hybrid events, education and healthcare. We can expect that the value created by mobile apps in the European Union will continue to grow in the years to come.

¹³⁸ Criteo

5 Appendices

5.1 Methodology to determine the size of the smartphone-only population

201. For each country in the European Union, the size of the mobile-only population was estimated by taking the difference between the number of people having access to the internet via a mobile and via a fixed connection.
202. Data on the number of fixed broadband and mobile broadband subscriptions at the country level are provided by the ITU. We assumed that a mobile subscription provides a personal access to the internet (for one person) and a fixed subscription for the household. World Bank data on the size of households per country were used to estimate the number of people per country that have internet access via a fixed connection.
203. The penetration rate is calculated with respect to the population aged 10 to 80 years old, as we consider that this is the population likely to have a mobile phone¹³⁹.
204. Finally, we are interested at people who have only a mobile access to the internet and use a smartphone. At the European level, 75%¹⁴⁰ of mobile subscriptions concern smartphones. This final adjustment results in a smartphone-only population of 14.7%.

5.2 M-commerce revenues

205. Criteo reports that M-commerce represents 43% of e-commerce in 2018¹⁴¹. By hypothesis, we assumed this share the same for 2019.
206. E-commerce revenue from consumers was obtained from Eurostat data gathered through the 2019 survey on 'ICT usage and e-commerce in enterprises'¹⁴². The data provides the share of turnover due to e-sales. Only 3% of total enterprise turnover in the EU stems from consumer e-spending (2018)¹⁴³. We assumed this share equal in 2019. These figures were combined with Eurostat's 2018 enterprise turnover data to obtain the value of e-commerce due to consumers. An estimate for 2019 was obtained by assuming that enterprise turnover increased with the same growth rate in 2019 as in 2018.
207. The value of total M-commerce revenue in 2019 was obtained by determining the consumer share of e-commerce.

5.3 The number of induced jobs

208. The study by the Progressive Policy Institute (PPI) assumes different job multipliers than the ones estimated by our IO-analysis, specifically for induced jobs. The PPI assumes that one induced job is created by the wages of every two direct and indirect jobs combined. The IO-

¹³⁹ <https://techcrunch.com/2016/05/19/the-average-age-for-a-child-getting-their-first-smartphone-is-now-10-3-years/>

¹⁴⁰ Eurostat data

¹⁴¹ Criteo 2018

¹⁴² https://ec.europa.eu/eurostat/statistics-explained/index.php?title=E-commerce_statistics

¹⁴³ Video: e-commerce explained <https://ec.europa.eu/eurostat/cache/infographs/ict/bloc-2c.html>

analysis with Eurostat data results in a lower estimate of 0.67 induced jobs created by every two direct and indirect jobs. A possible reason for our lower value of the number of induced jobs may lie in our estimation of the fraction of wages that is consumed (and not saved or paid in taxes).

209. Applying the multipliers obtained through our IO-analysis, the 672 000 direct jobs identified by PPI generate an additional 1 million indirect and induced jobs. This results in a total of 1.7 million jobs supported by the app economy.

210. We conclude that the total number of jobs supported in 2019 by the European app economy is at least 1.3 million and possibly up to 1.7 million, direct, indirect and induced jobs combined.

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