



The Economic Impact of the Market-Making Internet

Advertising, Content, Commerce, and Innovation:
Contribution to U.S. Employment and GDP





The Economic Impact of the Market-Making Internet



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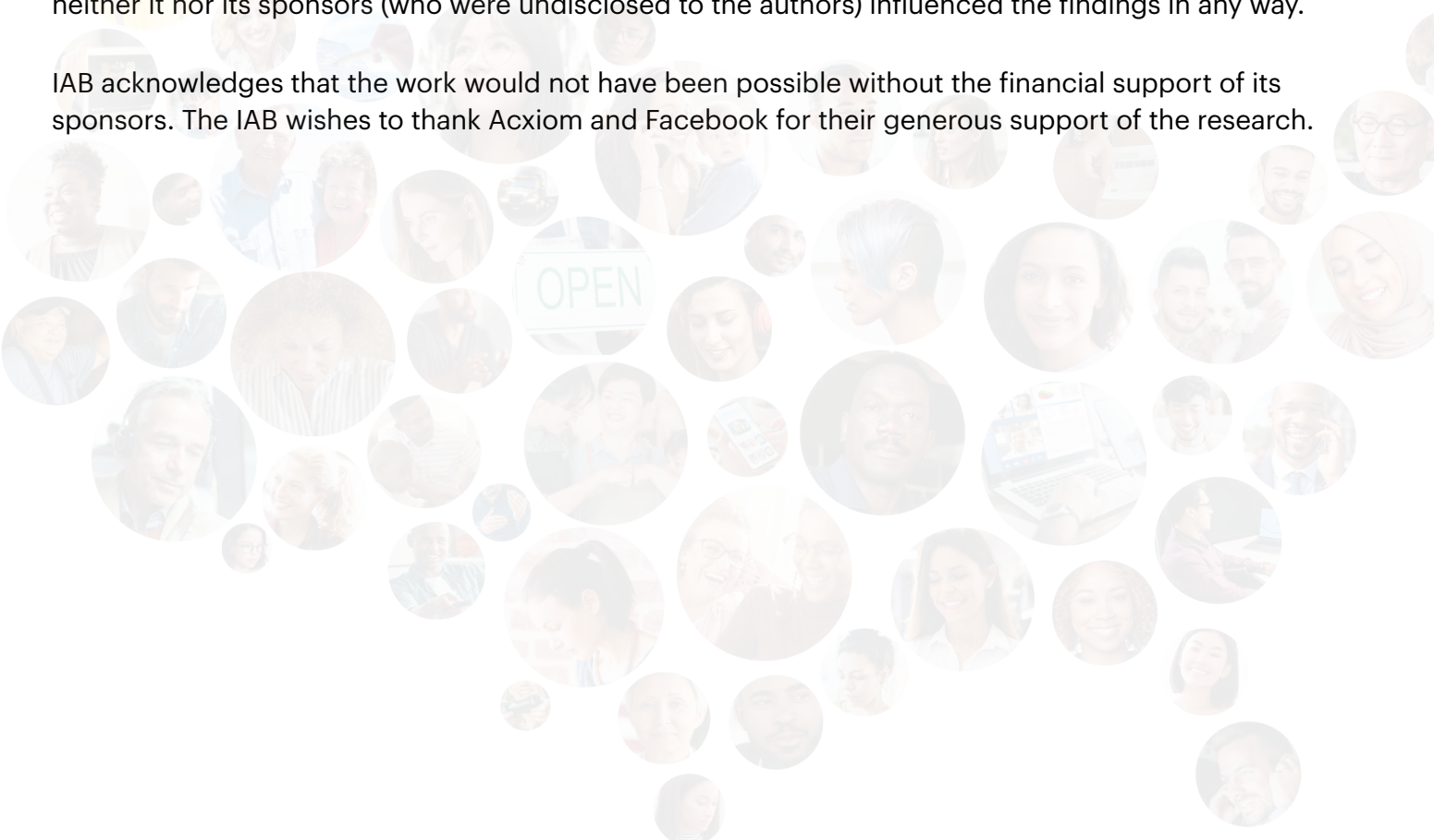
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Summary of Findings

This is the fourth in a series of reports that measure the economic value of the commercial internet, published every four years since 2008.

1. The internet economy grew seven times faster than the total U.S. economy during the past four years, and now accounts for 12% of U.S. gross domestic product (GDP).

**2.45
Trillion**

Internet economy's contribution to the U.S. GDP
(with 22% growth per year for the past 4 years)

The internet economy's contribution to the U.S. GDP grew 22% per year in the last four years, in a national economy that grows at between 2% and 3% per year. In 2020 it contributed \$2.45 trillion to the United States' \$21.18 trillion GDP. Since we began measuring in 2008, the internet's contribution to GDP has grown eightfold, from \$300 billion to \$2.45 trillion. These conclusions are summarized in table 6.2.1.

2. More than 17 million Americans owe their jobs to the commercial internet.

The commercial internet directly generates seven million jobs, and indirectly provides jobs to another 10.65 million people who are meeting the needs for such tasks as schooling, entertainment, banking, retail, and government services, for the directly employed workforce. This number of 17 million direct and indirect jobs compares to three million when we began measuring in 2008.

3. Every congressional district has internet-dependent employment.

Although seven congressional districts each have at least 10% of their residents working directly in the internet ecosystem, those districts account for only 9% of total U.S. internet employment. 91% of internet employment is spread across the other 428 congressional districts, in all 50 states. 272 congressional districts had at least 10,000 internet-dependent jobs. There are 31 congressional districts that depend on the commercial internet for at least 5% of their population—including districts in Arizona, Colorado, Florida, Georgia, Massachusetts, Minnesota, New Jersey, North Carolina, Texas, Virginia, Washington, and the District of Columbia.



4. More internet jobs are generated by small firms (19%) and self-employed individuals (19%) than by the largest firms (34%).

We analyzed thousands of smaller firms as aggregations. We estimate that those with annual revenues over \$40 million created 27% of the internet's jobs, and firms under \$40 million created 19% of the internet's jobs. Even further out on the jobs tail, self-employed individuals and people working in small teams of five or fewer people made up a further 19% of the internet job total.

5. Internet-enabled platforms have generated 1.3 million jobs for people who are self-employed or working in teams of five or fewer.

The internet has cut the frictions that once made it hard to do part-time work. Millions have taken advantage of the connectivity of the web and apps to supplement their incomes. Others have formed small-to-medium firms. Because some of this part-time work is a less remunerative than full time work, we convert part-time jobs to full-time equivalents (FTEs) earning the U.S. average wage of \$55,000 per year.

We estimate that 850,000 people are self-employed and 450,000 work for small businesses in jobs that could not exist without the internet, in three sectors:

1. Working on platforms other than retailers:

Airbnb hosts	133,000
Uber and Lyft drivers	280,000
Amazon Flex drivers	70,000
Instacart workers	62,000

Smaller numbers work for firms like Grubhub, DoorDash, TaskRabbit, Fiverr and Upwork, and work as online instructors on platforms that include Udemy, Kajabi, and Skillshare, and online therapists on BetterHelp, Talkspace, and others. We also find 100,000 people working independently in more traditional fields like web development, graphic design, and writing.

2. Selling on ecommerce platforms and websites:

Platforms:

Amazon sellers	100,000
eBay sellers	60,000
Etsy sellers	58,000
Craigslist sellers	48,000



Websites enabled by eCommerce tools:

Shopify	20,000
WooCommerce	20,000

3. Working in the creator economy:

Several million people work, mostly part-time, as performers and entertainers (e.g., in music, online game commentary, short comedy, and as newsletter writers, fiction writers, fitness instructors, artists, and as brand influencers). They use familiar platforms like YouTube, Instagram, Snapchat and TikTok, and more specialized platforms like Twitch, Roblox, Bandcamp, Sessions, Substack, Revue, Medium, Wattpad, and Cameo, and crowdfunding platforms like Patreon and Kickstarter. We estimate 200,000 FTE workers which, when combined with items one and two, adds up to a total of 1.3 million FTE self-employed jobs and jobs in teams of five or fewer people.

6. There are nearly as many creators on the internet as there are members of the main U.S. entertainment unions.

As noted above, there are 200,000 full-time equivalent jobs in the online creator economy. This number is close to the combined memberships of craft and labor unions SAG-AFTRA (160,000), the American Federation of Musicians (80,000), the Writer's Guild (24,000), and the Authors Guild (9,000).

7. There are 2.1 million ecommerce firms operating in the U.S. which generated \$715 billion in revenues in 2020.

Amazon is the largest ecommerce firm, with 2020 U.S. ecommerce revenues of \$213 billion. The next nine U.S. ecommerce firms generated \$118 billion in revenue, which is 46% of total 2020 U.S. ecommerce revenues. The next 500 ecommerce firms accounted for \$300 billion revenues, or 42% of total revenues. About 2.5 million people work in online retailing and shipping of retail goods to customers, which is about one-quarter the number working in offline retail.

8. Total employment in news- and information-related publishing tripled between 2008 and 2020, and job-growth rates in the sector are accelerating.

News and information companies like Bloomberg and Thomson Reuters, digital publishers like Vox and The Knot, and multi-platform/multi-genre publishers like Hearst and Reddit employed more than 142,000 people in internet-derived jobs in 2020, three times the 46,000 they employed in 2008, and 73% more than they employed in 2016.



9. Digital entertainment sectors grew their revenues 13x and their internet-related jobs by nearly 4x in just the last eight years.

Podcasting, streaming video, and digital gaming, which barely existed as industry segments when we did our first study in 2008, last year employed 34,000 people and generated more than \$40 billion of U.S. revenue from internet-related activities. Digital entertainment companies doubled their employment during the last four years.

10. Internet platforms other than retailers, like Airbnb, Uber, DoorDash, and Instacart, which combine marketing and business-process-support functions, directly employ more than 26,000 people in the U.S. and sustain more than 632,000 full-time-equivalent jobs among independent workers on the platforms.

The total number of independent workers on these platforms is 5.5 million, but many work part-time, and when expressed as full-time equivalents earning \$55,000 each in 2020 their number is 632,000 and they add nearly \$68 billion to the U.S. GDP.

11. The human resources function made extensive use of the internet in 2020.

Prior to 2016, we found no firms producing internet software for use by corporate human resources departments. In 2016 we attributed 5,600 jobs to HR software development. Four years later in 2020 we found 83,000 jobs, a 13-fold increase. HR technologies enabled corporations to migrate functions like payroll, benefits, wellness, and personal development to the internet. Recruiting has had a much longer history on the internet, but even there, jobs grew fivefold in the last four years, to 16,400.

12. More than half of all U.S. advertising and media employment now derives from the internet.

Following in line with the movement of brand spending to online media, more than half of the employment in the advertising and media fields is internet related.

13. As the internet has grown, its infrastructure has been used more efficiently. While the internet ecosystem grew eightfold since 2008, its infrastructure merely doubled.

By infrastructure we mean the ISPs and transit networks that carry data long and short distances. The firms in this sector employed 181,000 people in 2008. In 2020 they employed 350,000 people, fewer than twice as many.



Chapter 1: Introduction

1.1 Purpose of the Study

This study, fourth in a series published every four years, was commissioned by the Interactive Advertising Bureau (IAB) to understand the size, scope, and benefits of the market-making internet in the United States. It follows the structure and method of three earlier studies also commissioned by IAB, published in 2008, 2012, and 2016.¹

The specific objectives of this and the earlier studies has been to:

- i. Define the market-making internet
- ii. Determine the employment and value of economic activity enabled by this ecosystem
- iii. Determine its geographic dispersion
- iv. Identify the companies associated with it
- v. Determine the contribution of advertising to supporting it

In commissioning these studies, IAB has sought to track over time the contribution that advertising on the internet has made to the U.S. economy. Its goal has been to build a fact-base to demonstrate the contributions of the industry and its underlying technologies and processes to stakeholders, including the public, business leaders, thought leaders, and policy makers, in an objective and verifiable manner. The IAB and the authors share a common interest in objectively determining the size and scope of the ecosystem that lives on and alongside the internet, the contributions it makes to U.S. gross domestic product, and the contribution advertising makes, directly and indirectly, to supporting it.

Like most infrastructure, the internet is funded in several ways: there are fees paid to owners and builders for access to the internet, and there are purchases of equipment and services to build and operate elements of the internet for private advantage. Some funding takes the form of payments by marketers to publishers and other media for the right to market to the traffic. These payments lessen the cost that each user must pay to receive the benefits of the internet.

The study estimates the value of the market-making internet, expressed as a contribution to the U.S. gross domestic product, and estimates the fraction of that value that is funded by advertising. We use the term “advertising” in both its narrow sense, as payments made to media by the providers of goods and services or their intermediary agencies for marketing communications services; and more broadly, as a representation of all the market-making services that underpin the development, manufacture, distribution, marketing, selling, and delivery of goods and services to consumers.



1.1.1 Definitions

Our topic is so all-pervading today that credibility requires that it be carefully defined. We first define the internet and then the market-making internet, then we exclude illegitimate uses, and then the market-making internet ecosystem.

We distinguish between the internet (our topic) and the web (a subset of our topic.) The internet is a global network of many millions of computers, cloud data stores, and the connecting cabled and wireless pathways on which data packets are routed under the direction of software to destinations where they are interpreted by hardware and software. Described most succinctly, the internet is a digital data delivery service.

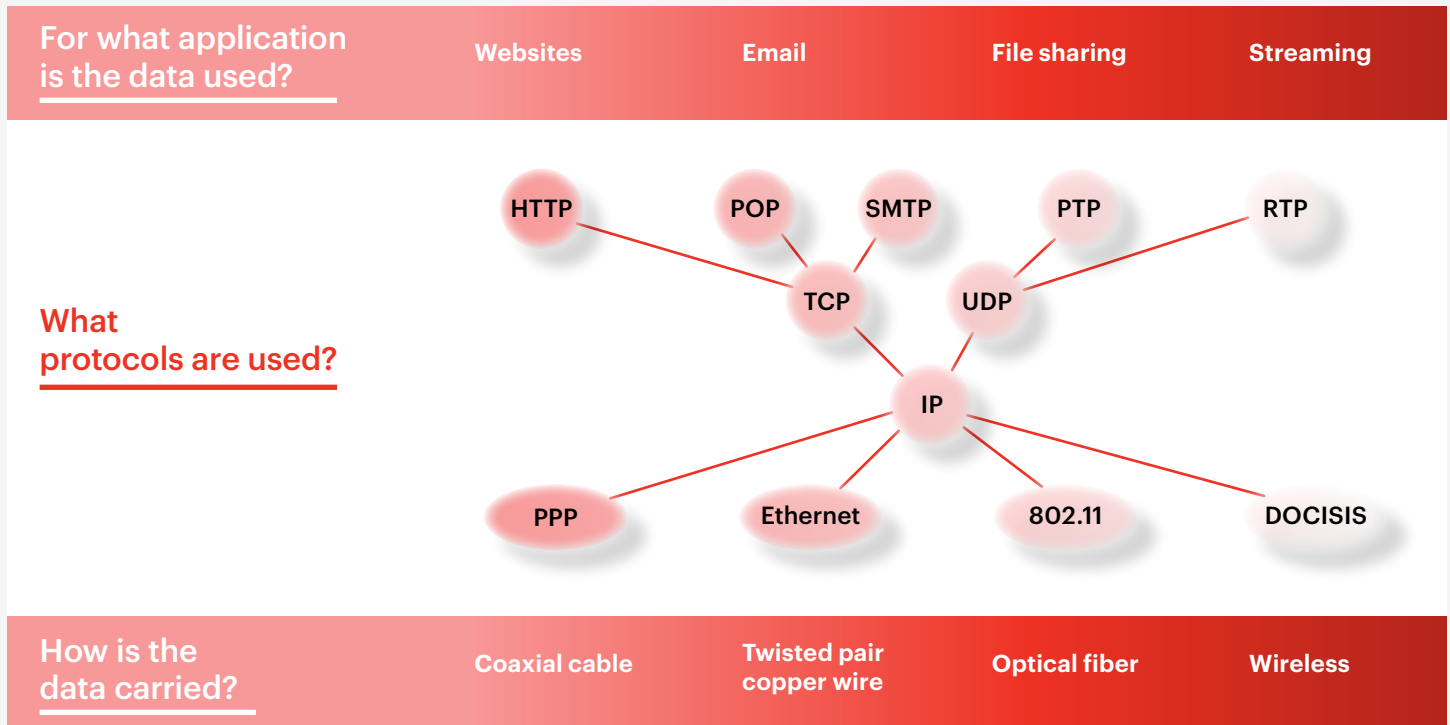
The web uses this delivery service to share text data. Others use the service to carry voice data, to stream music and video, and to send mail. So, the web is just one of a number of protocols that move data around the internet ecosystem.

We define the internet as any pathway that uses the internet protocol (IP) software convention. The IP was designed to be separate from, and quite independent of, the higher-level software applications that run on it, creating an open platform that can carry data of any kind, whether written to be read by email, file sharing, video streaming, or website assembly software. The internet was also designed to be separate from many lower-layer physical networks such as coaxial cable, ethernet, telephone networks, cable networks, and wireless networks, without the need to tailor them to particular end uses.

The IP has been such a remarkable economic force because it carries many kinds of data on many physical architectures, almost without restriction. Figure 1-1 illustrates the many kinds of data flow that are switched by the IP. It is just one layer in a stack of protocols to transmit data from various physical networks to various software applications, but it is a particularly important layer. The stack has an hourglass shape, so that many kinds of data pass through the IP layer of the stack. The IP enables packet switching and is distinct from and independent of voice networks that rely on circuit switching. Thus, the IP links disparate networks carrying digital information, and empirically is easily distinguished from other networks that carry analog information, including voice transmissions.



Figure 1.1 Internet Architecture



The internet is vast, but it has limits. What limits it is—as Robert Cannon has argued²—that it can reach only the addresses in a unique address space. This address space is defined, and with it the extent of the internet is defined, by the unique set of IP number addresses assigned by the Internet Corporation for Assigned Names and Numbers (ICANN), a non-profit corporation based in California, to large users of data, and to internet service providers (ISPs) on behalf of small users including individuals and households. In Chapter 4 we examine how a market is made in these addresses.

Having defined the internet, we define the **market-making internet**. Across the four studies in our “Value of the Internet” series, we have selected from the sum of all data that uses the IP, only data that flows for the purpose of making markets. We use a five-factor test to include a producer as a market-maker, and a five-factor test to exclude a firm.



To be included, an IP address must meet one or more of these tests:

- A producer is part of the market-making internet if it is remunerated, whether by subscription, advertising, sponsorship, or other means, for producing a digital service or product for consumers or firms, such as entertainment, useful content, or services.
- The producer helps to make transactions happen between buyers and sellers, including by advertising to, recruiting, or targeting customers or prospects, or creating a medium on which others can advertise, or operating a platform on which buyers and sellers can communicate.
- The producer aggregates market demand or supply.
- The producer uses networked digital technology to disintermediate traditional market gatekeepers.
- The producer deploys an innovative market-making model such as freemium, software as a service, crowdfunding, or crowdsourcing. Thus Linux, which makes its products available at no charge and goes on to earn revenue from professional support services to users, is included. Similarly, we include internet-based organizations like GitHub, acquired by Microsoft in mid-2018 because it enables Microsoft's commerce, and firms like Dropbox, which offer free services but also paid versions.

IP addresses are excluded from our definition of market-making if:

- They are public (monopoly) services including national, state, and local government services such as defense, policing, public schooling, and non-market medical services.
- They are services that run on the internet but do not make markets. For example, when a firm uses the internet to manage the travel and entertainment expenses of its employees (in contrast to hiring a vendor to do it) or uses the internet to manage its own enterprise vehicle fleet management, it is excluded from the market-making internet.
- They are related to production of academic research, which is a public good.
- They are donor-supported social collaborations such as Wikipedia and the Apache Software Foundation, which governs the production of widely used free server software. (Note that Wikipedia has announced its intention to create an Enterprise arm³ which might be included if it began to charge for the fortnightly data dump currently available at no charge.)
- They are volunteer services such as the Mozilla Foundation. (The Mozilla Corporation is included because its product Firefox is commercial.)



Physical-world processes are excluded from the Internet ecosystem, such as the human elements of personal selling. But in an increasingly data-driven world, many market-making processes are supplemented by data flows and people who perform these data services. So, when a firm in the system does both analog and digital work, we include the digital work and exclude the analog work.

This report puts a value on the **legitimate market-making Internet**. The internet has some illegitimate uses, and they play no part in our valuation.⁴

Finally, we explain the **market-making internet ecosystem**. Ownership of the network is highly dispersed across a large number of firms, government agencies, and open-source entities. We use the qualifier “ecosystem” to refer to the aggregation of businesses that depend on and co-evolves with the internet infrastructure. Ecosystem does not have a long pedigree in economics, but it is useful here. It derives by analogy to biology, where it refers to an interdependent system of living organisms, from plants and animals to microorganisms, taken together with the inert elements of their environment such as water and soil. Although the term has been used in business and economics since at least the 1970s⁵ it has become popular in more recent years in the information technology industry, where the interdependence of businesses relying on a common set of technologies is a central fact. Moore (1996) wrote of a business ecosystem as a “...community [of firms that] co-evolve their capabilities and roles and tend to align themselves with the directions set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments, and to find mutually supportive roles.”⁶

The structure of a business or organizational ecosystem has been investigated by Mars, Bronstein and Lusch.⁷ They find that players interact in patterns that are sometimes mutually advantageous, sometimes competitive. They argue (as do Iansiti and Levien⁸) that some players act as keystones, in the sense that they occupy hubs in the exchange network whose health assures the health of the whole system. The ecosystem, they find, is a nested structure in which functions and priorities often overlap. These redundancies create resilience, and conversely their absence puts the system at risk of collapse. They argue that organizational ecosystems, unlike most biological ecosystems, have foresight and can anticipate conditions that might lead to system collapse. The more complex the system, and the more turbulent its evolutionary path, however, the more difficult it is to understand the interdependencies that put the system at risk. Finally, they emphasize the emergent nature of business ecosystems. While strategy and deliberate design are never irrelevant, they are not the determinants. An ecosystem cannot be designed into existence, although a legal regime, a regulatory regime, education, and access to capital can be designed to enable its continuity.



One question the study seeks to explore is the extent of the ecosystem’s reliance on advertising to support it. Advertising can be read narrowly as payments by advertisers to publishers, following the precedent established in the pre-internet world. In that world, ‘advertising’ did not cover advertising on so-called ‘owned’ media such as displays on the sides of a firm’s trucks and buildings, nor did it cover direct mail, catalog retailing, or telemarketing. However, in the digital economy, this distinction underplays one of the important economic consequences of the internet. The marketing effects of the internet ecosystem, particularly those of owned and earned media, are very substantial. Payments to publishers do not measure all that the internet does to make the markets that create the economy. Nor does the conventional use of the term ‘advertising’—as marketing communication distributed on legacy print, electronic, or outdoor media—adequately capture the range of market-making activity the internet has enabled.

The internet, in sum, serves many legitimate commercial purposes besides advertising in the narrow sense of the word. Websites can serve as storefronts, point-of-purchase stimuli, as tools for conducting research online for offline purchase, and to transact online based on research offline. Websites can aggregate consumer reviews. Consumers can see products promoted and buy them in a single visit. They can download digital products and consume them online. They can share news about their purchases, share their opinions, and review products and services on social media. They can verify ownership by using non-fungible tokens (NFTs), a blockchain-based system to back claims on collectible digital products and assets. (NFTs are estimated to have generated \$2.5 billion in sales in the first half of 2021, up from virtually nothing two years earlier.)⁴¹⁸

Back to the policy goal of the study, we explore the internet’s many advertising benefits besides those that come from narrowly construed media spending.

1.2 Structure of the Internet

Our earlier studies described the origins of the market-making internet about 25 years ago, and we will not repeat that material here. Greenstein (2015) has an excellent and more extensive account.⁹ As the market-making internet grew, a three-layer structure focused on the customer emerged. There is a layer of infrastructure, a layer of support functions, and a layer of consumer services, which consumers either buy or receive for free.



Figure 1.2 Structure of the Internet 2021



1.3 The Internet Enables the Information Economy

12% of the
U.S. GDP

The commercial internet accounts for 12% of the U.S. GDP in 2020

The introduction of the internet has shaped U.S. economic development on a scale comparable to, and likely exceeding, the introduction of electrification in the last quarter of the 19th century. By our calculation, the commercial internet today accounts for 12% of the U.S. \$21 trillion gross domestic product and generates 17.65 million jobs—nearly 11.6% of total U.S. nonfarm employment. The internet’s ability to generate new companies, new functions, new products and services, and new jobs derives from six core attributes of an information-based economy.



1. Firms can scale at **very low cost**. Once a digital solution to a consumer need has been developed, the cost of serving new users is usually very low. An early instance of the ability to scale at low cost was the Facebook social network.
2. They can **scale very fast** relative to the industrial age. Facebook's customer base grew faster than any product in history before it. In the four years since our last analysis, employment in the U.S. by Yelp grew by 300%, Salesforce by 250%, and Netflix by 210%. Because firms can scale does not mean they always do, however. Competition can scale equally rapidly and may exhaust market demand. Nevertheless, information economics helps economies to find, experiment with, and exploit opportunities in months or years, not generations.
3. It is **almost costless to match** products to buyers' individual needs. Provided privacy concerns do not get in the way, automation can deftly match people to products and services. In advertising today, a typical brand in the U.S. is offered about nine million opportunities to advertise per second and can select the best 5% every second.¹⁰ Rapid digital matching is an essential feature of the business models of most consumer services, for example Netflix, Spotify, Airbnb, and employment services like ZipRecruiter. Years-long trial-and-error methods of market segmentation is being replaced by algorithmic matching that can be built in days and tested and refined in weeks.
4. Current customers can help firms match a firm's offerings to new customers by writing reviews. **Customer feedback** not only speeds the elimination of inferior products but identifies differences among products that only experienced consumers are aware of. Reviews help match travelers to travel services at Tripadvisor, to entertainment at YouTube, and to consumer goods at Amazon, for example.



5. Firms build on each other's ideas in the internet ecosystem. The physical economy thrived on competition, as firms erected barriers to protect their investments in physical assets. **The digital economy thrives on interdependence and innovates to bypass monopoly.** For example, what seemed to be the natural monopoly of buried cable invited the invention of new ways to transmit signals. Cable distribution of video gave way to streaming by subscription. Then subscription services were complemented by ad-supported services like the Roku Channel, Hulu, and Pluto TV. In January 2021, 34% of U.S. households with video streaming capability used the ad-supported option.¹¹ As the opportunity to view digital content has been liberated from the monopoly of cable, so video content producers have built on the innovation to create new genres and even form factors, such as short video, and in turn have found new audiences and new markets in the U.S. and around the world.
6. **Reduced cost of innovating digital business models** has led to a faster pace of change. New ideas come to market faster, and established ideas evolve faster. One reason is experimentation. In the physical economy experiments are costly and slow. The information economy makes systematic, controlled experimentation a natural way of working. Our 2020 report shows many instances of accelerated innovation and deployment. For example, the market in insights from web logs that Splunk pioneered has expanded rapidly in the last five years.



Chapter 2: Methodology

2.1 Bottom-Up Employment-Based Methodology

The main goal of this report is to estimate how many jobs in the U.S. economy exist because of the market-making internet ecosystem. We set that goal because it measures the size of the internet, its growth across the 12 years of these studies, and is a vital input into public policies that shape the internet. The internet exists because of past policy actions. Policy applies abstract principles, but it works because it has real consequences for concrete firms. We want the credibility of the method used in this report to rest on facts that can be traced to specific firms and their strategies. Where possible we did not want conclusions to be derived from abstracted theory or unacknowledged inference.

We want, to the extent possible, to name the firms that create these jobs. We relied not on reports of the U.S. Census Bureau and the U.S. Bureau of Labor Statistics, which are built from anonymized surveys of firms and are bound to protect the identities of responding firms. Instead, we relied where we could on what firms told the U.S. Securities and Exchange Commission in public filings. Inevitably there were gaps. Private firms, for example, make few or no public filings. To fill these gaps, we subscribed to D&B Hoovers, a product of Dunn & Bradstreet which draws on its global database of more than 330 million companies. We looked for convergent evidence from ZoomInfo, S&P Capital IQ, Statista, and other sources.

The method takes as a starting point, the North American Industrial Classification System (NAICS) codes of firms studied in the 2016 report. For each NAICS code we identify the largest and most material of employers. We take their total revenue and employment, in most cases, from U.S. public filings, or in a few exceptions from foreign filings or commercial services. We then estimate the proportion of revenue and employment attributable to the internet-related activities of these firms in the U.S. This stage of the method is precise with respect to the firms studied but uses documented judgment with respect to their internet-relevant employment and U.S. revenue. Next, the methodology forms these firms into sectors and makes estimates of the number of smaller firms or self-employed people in each sector in all other categories.

We allow for sectors comprising firms that were individually small but large in aggregate, small online retailers, and people working in large and mid-sized general enterprises performing work on the internet but not otherwise counted in the internet ecosystem. Finally, we count self-employed workers such as sellers on Etsy, individual sellers on eBay, on-demand economy workers, creator economy workers, and freelance individuals doing coding, content creation, and other services for websites.

For each person directly employed in a particular sector of the internet ecosystem, other people work in sectors that supply the sector or that benefit from retail and service sector spending by these workers. The focal sector also helps to support taxation-dependent areas of the economy, such as government



and public sector workers who are employed in federal, state, and municipal services, education, and the military. This indirect employment, computed by applying employment multipliers to the sector's employment, arises from supplier effects, re-spending effects, and government employment effects. The U.S. Bureau of Labor Statistics publishes statistics on industry employment requirements, which enable calculation of the labor inputs into a sector. Sectors differ in the size of their multipliers. Bivens¹² computes indirect employment that ranges from 372 indirect jobs for every 100 jobs in durables manufacturing to 163 indirect jobs for every 100 jobs in business services. These estimates are inclusive of capital service usage. We then apply a fully burdened labor cost (comprised of wages and salaries, the cost of benefits, onboarding, management overhead, vacation time, and facilities costs) to these employees.

2.2 Top-Down Employment-Based Approach

Our goal here is to assign internet employment to congressional districts. Here we cannot work with the named firms that we found in 2.1, because they do not report how their jobs are distributed across the country. Instead, we rely on the U.S. Census Bureau.

From the U.S. Census Bureau's databases, we identify categories of establishment with significant internet-related employment. As the U.S. Census Bureau protects the confidentiality of its respondent firms, we must use judgment to decide just what is meant by 'significant.'

The goal of this methodology is to map the location of employment in industries that are part of the internet ecosystem, to supply a broader distribution of employment than is available from the location of head offices. We use the U.S. Census Bureau's County Business Patterns (CBP) dataset, which gives the number of employees per county, both core and support, for each establishment in each of the approximately 700 five-digit codes of the North American Industry Classification System (NAICS).

From a detailed review of the industry definitions of each NAICS code, we identify 15 of the 700 that are likely to have meaningful amounts of internet-dependent employment. Three are entirely internet dependent, and 12 are partially dependent. For the latter we calculate an 'internet-intensity' ratio for its NAICS code. From our bottom-up data, which includes each firm's NAICS code, we compute the code's internet revenue as a fraction of total U.S. revenue. For codes where our bottom-up analysis does not yield a representative sample of companies, we use product line receipts from the 2017 Economic Census as an indicator of the proportion of revenue sourced from internet work. We did not rely on this method to corroborate the bottom-up methodology because the two methods are not entirely independent, and because while it is a good measure of the geographic distribution of employment, it is not a reliable measure of total internet employment.



Chapter 3: The Infrastructure of the Internet

Data travels on the infrastructure to deliver internet services. It travels on a complex system of servers, pipes, switches, and storage devices owned, in the U.S., by private companies that buy, sell, and rent from each other, and sell to downstream firms. They perform four functions: long range transmission of data, shorter range connectivity within data networks, manufacture of hardware, and the storage of data in data centers.

3.1 The Form of the Infrastructure

When the internet was commercialized in the late 1990s, many firms in the telecommunications industry pursued the transmission opportunity. They invested heavily to lay fiber optic cable across the U.S., Canada, Europe, Asia, and the oceans that separated them. Transmission infrastructure was oversupplied for the first decade of this century, including at the time of the first of our studies of the ecosystem in 2008. Voice and dial-up modem transmission of data placed little demand on the infrastructure. Bandwidth-intensive services such as video and music streaming, software as a service, mobile broadband transmission among cellphone towers, and big data analytics, began to emerge during the second phase, which began in second decade of the century, and began to deliver improved economic returns to the firms that had built the fiber infrastructure.

However, infrastructure firms still found it difficult to command the profitability of other internet layers. Some firms integrated into more profitable superstructure businesses. They had hoped to offer better service to the customers of the superstructure, by exploiting their domination of data transmission, but they were blocked when the Federal Communications Commission (FCC) sided with advocates of net neutrality, by which all data carriers must treat all internet content equally with respect to price and speed. Nevertheless, FCC policy has varied over time, particularly between the Obama and Trump administrations, and there remain strategic advantages to integration across transmission, connectivity, and provision of consumer services. We analyze these integrated firms in a later chapter.

3.2 The Infrastructure Is Evolving

The infrastructure of the internet was originally built on a trunk and branch form, which comprised a trunk made up of an intertwined and cross-connected set of long-haul fiber transmission lines known as the backbone, and branches to distribute data to the ultimate users. The distinction between transmission and distribution functions was a common feature of the infrastructures of utilities such as electrical power, telephony, and water, explained by the fact that transmission trunks, because they carry over long distances, have few customers to bill, while the distribution branches are dense structures with many customers to serve and bill. In our 2008 and 2012 reports, mirroring this first phase, we classified



employers into transmission and distribution groups. Transmission firms were then (and to an extent still are) those that transmitted data over long-haul (between geographies) and short-haul (within-cities) distances.

Transmission systems depend on collaboration among firms, and the largest firms, termed peers, do not charge each other for transporting their traffic, an arrangement known as settlement-free peering to avoid the administrative costs of billing each other. Distribution firms were (and to an extent still are) firms organized by the connection technology—cable, phone, and wireless. They moved data from the transmission systems to household and business subscribers and were commonly not shared. Indeed, a single subscriber could have relationships with several dedicated distributors, such as a cable subscription, a wireless subscription to a mobile phone, and occasionally a subscription to link an automobile to the internet. In the 2008 and 2012 reports, the three functions of hardware, transmission, and distribution, mapped relatively well onto three kinds of employer: the big telecommunications firms (telcos) handling transmission, cable operators, smaller telcos and wireless operators handling distribution, and the manufacturers making hardware and equipment.

Beginning in our 2016 study and becoming clearer in this report, we see new patterns of transmission. To complement and often to displace the backbone-and-branch pattern of the last two decades there are content delivery networks and data centers known colloquially as the cloud. They move data not simply linearly, from data sources to data consumers, but in a more branching pattern, sometimes described as storing data at the edge of the network. Three factors are at work in this evolution, disrupting the separation of transmission and connectivity and indeed beginning to disrupt the separation of infrastructure from consumer services.

First, as consumers have sought more than one way to connect to the internet, it was attractive for connectivity firms to organize by customer and geography, not by technology. Cable operators offered voice-over IP phone service, and wireless and cable modem internet connectivity. Telcos entered the wireless and optical fiber markets and largely displaced internet connectivity over copper wire. The opening up of millimeter wave spectrum created the possibility for wireless systems to carry large volumes of data. Several of the transmission firms now have significant connectivity businesses and as the two functions integrate, the backbone-and-branch pattern becomes less dominant.

Second, consumers began to use data in volumes too great for the backbone to handle with transit-free peering. They visited high-bandwidth content producers such as Netflix, YouTube, and Facebook, particularly at the times of day that used to be called prime time, when many homes streamed video.

Third, and in response, content delivery networks (CDNs) were formed, some owned by Google, Facebook, and Amazon, and some by independents such as Akamai, Cloudflare, Limelight, and Firstly. They took the form of clusters of servers located near concentrations of end users. These 'edge providers' complemented linear transmission. CDNs distributed data from data producers like Netflix



and Amazon to the data centers of ISPs so that end user requests could be responded to faster.

As a result of the growth of demand for data-intensive streaming services and new data generation by the internet of things (IoT), today very little of the internet's data travels from content creators to consumers on the backbone. Instead, this data moves on the edge of the network, from data suppliers to distribution nodes and on to homes. In this report we use the term CDN to refer to the location of jobs in firms that supply these edge flows. The largest data processors such as Amazon, Google, and Facebook own their own server farms, and, along with independents like Akamai, locate at points of high retransmission demand. Firms such as Salesforce, Adobe, Electronic Arts, Square, Splunk, Peloton, and Dropbox add to edge demand.

3.3 Firms Respond

The internet is a network of networks. In this section we identify the largest of the firms that built out and operate these networks and count their employment. These firms invest in and maintain the internet's data transmission and storage infrastructure. They specialize in, and largely confine their work to, provision of infrastructure. When a firm integrates infrastructure functions with other internet functions, we, as noted above, analyze them in the section on integrated firms.

Only 1% of internet traffic is transmitted by satellite. Most data travels on a global network of underwater and underground fiber-optic cables, from and to data centers that are connected to end users by neighborhood cable lines and local wireless lines. Internet service providers (ISPs) are conventionally categorized into three tiers:

Tier 1 ISPs are networks that make up the backbone of the internet. They connect to other networks at internet exchange points. If one connects to another that it recognizes as a tier 1 ISP, there is no charge to pass on the traffic under the principle described earlier as settlement-free peering. If this prior arrangement does not exist, the charge can be substantial. Therefore, between the backbone and the end user, two further tiers exist.

Tier 2 ISPs pay to transport on tier 1 ISPs. They may transmit for free with other tier 2 ISPs with which they have high reciprocity, but generally they charge or are charged for data transfer.

Tier 3 ISPs are the networks that connect consumers and businesses to tier 2 ISPs, which in turn connect to tier 1 ISPs if the distance is great enough. At the destination, a tier 1 ISP must reverse the sequence and pass the traffic to a tier 2 ISP and in turn to a tier 3 ISP to reach the end user.



3.3.1 Tier 1 Internet Service Providers

These firms provide high speed internet access, ethernet transport, and colocation services over long distances and some local connections. There are about 30 wireless service providers that own and manage their network equipment and facilities and about 50 smaller virtual operators that use the largest facilities-based networks to provide service.

The largest U.S. tier 1 provider is **Verizon**. Its mobile carrier is the second largest wireless network in the U.S. Earlier this year it sold its media group, including AOL and Yahoo, to Apollo Global Management for \$5 billion, retaining a 10% stake. It reports that its international revenues in 2020 were not significant, and its revenues are almost entirely internet dependent. Therefore, from SEC filings we conclude that the share of Verizon's revenue relevant to this report is \$129 billion. **AT&T** is the second-largest tier 1 provider in the U.S. In our last report it was covered, along with Verizon, in the section on integrated firms, but after AT&T's divestiture of 80% of its stake in Warner Media to Discovery, and Verizon's sale of Yahoo and AOL, those decisions can no longer be justified. Because of the planned Warner Media divestiture, we exclude its revenue from the figure reported in AT&T's 2020 SEC 10-K filings. The filings report income from U.S. customers as 90.8% of income including Warner Media, and without better information we apply that ratio to income excluding Warner Media. Of the four reporting segments, mobility, video, broadband, and business wireline, we assume all but 5% is internet dependent. We conclude that U.S. revenue is \$109 billion. AT&T reports global employment of 230,000, and we ascribe a proportion to the U.S. in line with revenue. Third is **T-Mobile** which, after it acquired Sprint, a tier 1 provider,¹³ we classified it into this section. We estimate that two thirds of its total employment and revenue is internet-related.¹⁴ Next is **Lumen**, which in recent years has acquired Level 3 Communications and CenturyLink.¹⁵ **Zayo** has been a private company since 2019 but based on earlier public filings and press coverage¹⁶ we estimate that it employed 3,700 people globally and earned revenues of \$2.6 million, with 70% of employment and earnings within the U.S. **GTT Communications** earns more than 50% of its \$1.72 billion annual revenue outside the U.S.¹⁷ **Cogent** operates in North America, Europe, Asia-Pacific, and Latin America. It earns \$485 million of its \$546 million global revenue in the U.S. where 772 of its employees are based.¹⁸ We estimate the 'All Other' category of tier 1 network firms contributes 3,600 jobs.¹⁹

The revenue of most of these firms, including AT&T, T-Mobile, and Lumen, is earned for services other than tier 1 transit. We do not attempt to assign the diverse sources of revenue to other tables. If they provide tier 1 service, we count them here.



Table 3.3.1 Tier 1 Transmission Providers

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Verizon	\$128,800	132,200	10036
AT&T	\$108,591	145,412	75202
T-Mobile (includes Sprint)	\$20,000	26,000	98006
Lumen (was Level 3, CenturyLink)	\$12,200	24,940	71203
Zayo	\$1,820	2,590	80301
GTT Communications	\$774	1,500	22102
Cogent Communications	\$486	770	20037
All Other	\$2,000	3,600	
Total	\$145,871	204,812	

3.3.2 Short Range Connectivity

As data storage has transitioned from local storage on a firm’s own servers to distributed storage on a widely dispersed, often global, network of data centers, connectivity’s role in the internet’s infrastructure has grown. Data once stored on disk and backed up onto tape is now often backed up, managed, and stored on a variety of systems that range from private server to public and private cloud. This evolution has been driven by growth in the quantity of data generated in business and personal life, in the declining cost of server storage, and the demand for redundancy in data storage. Storage has moved from a private fixed cost to an outsourced variable cost.

Connectivity firms provide some transmission, and transmission firms offer connectivity, so there is a degree of arbitrariness in the distinction we are making between the two, but our general rule is that firms listed here retail connectivity to much smaller clients than do the tier 1 transmission firms, particularly to households, and often sell it as a complement to more profitable services delivered on their pipes, such as cable television, voice, and wireless telephony, or to internet services such as email and spam protection providers. Where once connectivity was envisioned as an opportunity to become a portal with proprietary content, it is currently viewed as a near commodity.

We distinguish three kinds of short-range ISPs based on how they connect users to the internet: cable television providers, Internet access providers, and mobile internet access providers.



Cable television signals are transmitted on coaxial cables. With head-end modification, these cables can transmit in both directions, have ample capacity to carry data and are capable of bi-directional carriage of signals as well as the transmission of large amounts of data. Coaxial cables can transmit broadband internet access if cable modems are installed.

Comcast is historically an internet infrastructure play, the largest ISP provider in the U.S., but it is pursuing a vision as an integrated firm because it has diversified into television content production and distribution, so we analyze it in the 'Integrated Firms' section.

Charter Communications, after its acquisition of Time Warner Cable, is the third largest ISP in the U.S. after Comcast and AT&T, with revenues of \$48 billion and employment of 9,500 in 2020. We estimate internet revenue and employment based on SEC 10-K filings. **Cox Enterprises** was analyzed as an integrated firm in 2016 but we have decided to move it to the Infrastructure section this year because despite the integration of its cable ISP with automotive marketing services its contribution to internet employment derives mainly from the cable ISP role. Privately held, Cox Enterprises employs 55,000 and has revenues of \$21.1 billion. We assign half of the \$11 billion cable revenue and most of automotive group revenue to the internet, but none of the media group revenues. The 'All Other' category of cable providers including TPG, WOW!, and Atlantic, collectively account for about three million subscribers.²⁰

Table 3.3.2.1 Cable ISPs

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code	Subscribers
Comcast (reported in the 'Integrated Firms' section, therefore in red)	\$24,300	42,470	19103	22,400,000
Charter Communications	\$21,500	42,500	19103	15,700,000
Cox Communications	\$9,500	24,700	30328	4,132,000
Altice USA (formerly Cablevision Systems)	\$4,180	7,500	11101	3,150,000
Windstream Holdings	\$3,418	7,307	72212	1,110,000
Mediacom	\$270	753	10918	830,000
Cable One	\$260	700	85012	820,000
All Other	\$4,000	8,000		3,000,000
Total (excluding Comcast)	\$43,128	91,450		



Other ISPs deliver signal on mobile, satellite and fiber connections. We list them by the dominant internet service. **Telephone and Data Systems** delivers telecommunications services through two brands, TDS Telecom and UScellular, the latter providing most of the company’s internet employment. Our estimate of internet revenue excludes its equipment sales. Following its failure to acquire T-Mobile, AT&T acquired several smaller cellular services, including Cricket and C Spire.²¹ AT&T also owns the largest satellite digital content distributor, DirecTV. **Hughes Network**, subsidiary of EchoStar, is a global satellite ISP with 79.6% of revenue earned in North America.²² **Viasat** is a satellite-based competitor and one of its divisions, generating 35% of its \$2.3 billion revenue, is a consumer and business ISP. Another competitor, Dish Network, provides Internet service and IPTV services Sling and Boost. **Dish Network**, primarily a pay TV provider, earns a small revenue stream from direct provision of internet access to rural areas, and other revenue from indirect internet provision on behalf of the other satellite providers, which is credited to them.

Frontier Communications offers broadband, video, voice, and other services and products to U.S. residential customers over a combination of fiber and copper-based networks. Internet services represent 45% of revenues.²³ **Consolidated Communications** is a rural local exchange carrier with 46,000 miles of fiber, earning 45% of its revenue from Internet services.²⁴ We have an ‘All Other’ category to accommodate Fusion Connect, Harris CapRock, Shentel, and others.

Table 3.3.2.2 Other ISPs

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code	Subscribers
Mobile ISPs				
Telephone and Data Systems (UScellular)	\$3,035	4,173	60631	6,000,000
Satellite ISPs				
Hughes Network (subsidiary of EchoStar)	\$1,800	2,300	20876	1,300,000
Viasat	\$805	2,135	92009	
Dish Network	\$149	145	80112	
Fiber ISPs				
Frontier Communications	\$3,645	4,800	06851	3,500,000
Consolidated Communications	\$585	1,755	61938	
All Other	\$2,000	3,000		
Total	\$10,019	15,308		



3.3.3 Hardware

Internet-related hardware comprises computers, servers, storage devices, routers, switches, desktop and laptop personal computers, wireless access devices such as phones, fiber optic cable, and broadband wireless equipment, among other components.

There has been a shift in the last decade from manufacture of computing equipment to data handling, switching, and storage, with the growth in data centers, the cloud, and the shift from a linear to a networked structure. There has also been growth in demand for mobile devices, driven in part by demand for streaming video consumption, fed by video supply from media companies such as Netflix, Hulu, Google (YouTube), Amazon (Amazon Prime Video) and Apple (Apple TV+) whose employment is captured in other sections of this report.

U.S.-based employment in this sector is engaged in product design, software, marketing, sales, and service rather than manufacturing. For example, the U.S. has lost employment to Asian factories (e.g., half of the 23,000 employees of CommScope are located outside the U.S.). Our estimates of the proportion of employment due to the internet are sensitive to the revenues of their lines of business, and in some cases, we received guidance from people in the companies or industries. Our estimates are conservative.

Two of the largest U.S. manufacturers are not reported on in this chapter. Apple, a firm whose hardware component would make them the largest in the sector, is in the section on integrated firms. IBM (36,000 employees) is the next chapter because they now do more work in system design and consulting than in manufacturing.

Dell Technologies' Form 10-K has three reportable segments: infrastructure solutions, client solutions, and VMWare, plus other businesses that comprise Secureworks, Virtustream, Boomi, and RSA Security. We assess all employment and revenue as internet related. The company reports that 50% of revenue is earned in North America, of which we attribute 45% to the U.S. It reports that 37% of total employment of 165,000 is based in the U.S.²⁵ **Cisco Systems** dominates the U.S. market for internet protocol-based networking equipment and makes security devices, internet conferencing systems, and other network ancillaries. We assess all employment and revenue as internet-related, and following 10-K reporting we ascribe 60% to the Americas. We take 90% of that to be U.S.-based. Of global employment, the company reports 38,900 are in the U.S.



Qualcomm develops and commercializes foundational technologies for the wireless industry, most of which is part of the internet economy. Its 2020 employment of 41,800 is distributed across 40 countries.²⁶ With 27 regional U.S. offices²⁷ we estimate U.S. total employment at 20,000 and use the proportion of global employment that is U.S.-based to estimate U.S. revenue of \$11 billion. **Hewlett Packard Enterprise** has about half the revenue of the company of the same name in our 2016 study, having sold enterprise services to Computer Sciences Corporation and its software division to Micro Focus. Most of the remaining revenue is earned from platforms designed for compute, storage, networking, and IT services, and from network security. Consequently, we moved it from Chapter 4 to Chapter 3. **Broadcom** serves the data center, networking, software, broadband, wireless, and storage markets. It entered the network security market at the end of 2019 by acquiring the enterprise security assets of Symantec so our analysis covers this, the largest element of network security, here and not in Chapter 4. Similarly, it acquired CA Technologies, whose revenue and employment moves from Chapter 4 to this chapter.

Western Digital makes storage devices, of which devices used in servers and cloud computing data centers belong in this report. Half of sales are in the U.S., and half of the U.S. sales are internet related. **Seagate Technology** manufactures data storage devices. Revenues in 2020 were \$10.5 billion. Headquartered in Ireland and employing 33,500 of its 40,500 employees in Asia, we estimate U.S. employment because 19% of owned or leased space is in the U.S. **Juniper Networks** makes infrastructure hardware and software for large-scale networks for cloud computing. Company filings report about half of revenue (and we assume employment) is earned in the U.S. Other firms individually analyzed in this category include **Ericsson**,²⁸ **Commscope**,²⁹ **SuperMicro**,³⁰ and **Avaya**.³¹

New entrants to the hardware category in this study include manufacturers of audio and video that integrate internet-dependent streaming software, the largest of which are **Sonos**, **Roku**, and **Vizio**. In some ways these companies are similar in that they provide an easy to use, single interface for streaming multiple sources of content. Using Sonos' audio technology, for example, customers can wirelessly stream Spotify, Apple Music, Amazon Music, Audible, Deezer, TuneIn, iHeartRadio, Google Play Music, YouTube Music, and others. While Sonos targets the higher end, audiophile segment of the market, Roku and Vizio manufacture video streaming hardware and software that appeal to the more budget-conscious consumer. Both Roku and Vizio offer consumers access to subscription streaming services (e.g., Netflix, Hulu, and HBO) as well as access to hundreds of ad-supported free networks and channels.



Table 3.3.3 Hardware

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Dell Technologies	\$41,479	61,050	78682
Cisco Systems	\$27,930	38,900	95134
Qualcomm	\$11,200	20,000	92121
Hewlett Packard Enterprise	\$8,910	19,600	77070
Broadcom	\$8,500	14,600	95131
Ericsson	\$7,650	20,400	75024
Commscope	\$5,185	6,000	28062
Western Digital	\$4,000	12,500	95119
NetApp	\$2,430	4,500	94089
Juniper Networks	\$2,220	4,707	94089
Seagate Technology	\$1,995	7,695	95014
SuperMicro	\$1,960	1,463	95131
Vizio ³²	\$1,834	527	92618
Avaya	\$1,640	2,728	27713
Roku ³³	\$1,067	1,155	95032
Sonos ³⁴	\$605	999	93101
All Other	\$22,700	32,100	
Total	\$151,316	251,651	

3.3.4 Data Centers

The infrastructure of the Internet is evolving from one that supports a linear data flow to one that supports a network, where much data travels among firms on the periphery of the Internet and not on the backbone.

We use the term content delivery networks (CDNs) as an umbrella term to cover many ways of



assembling and owning these networks made up of proxy servers and data centers, providing some mix of cloud storage, data routing, networking, security, and hardware as-a-service to support this peripheral data routing.

The largest CDNs, Amazon, Microsoft, and Google, are analyzed elsewhere. Telcos, too, are major CDNs, as is Netflix, and they too are accounted for elsewhere.

Equinix operates 210 data centers in 55 markets, and its SEC filings ascribe 45% of its revenue and 3,672 employees to the Americas. We assign all but 5% of the Americas revenue and employment to the U.S. **Akamai** links about 250,000 servers in 130 countries, to deliver content globally with embedded security, but does not operate data centers per se. It attributes 60% of its \$2.89 billion revenue to the U.S. **Dupont Fabros** is a collection of privately held carrier-neutral data centers which, like many on this list, is structured as a real estate investment trust. Its revenue is \$2.6 billion and 64% of its centers in the U.S.

Rackspace Technology is a service provider to data storage firms, with multicloud services, application services and professional services. It was private for three years until mid 2020 so public filings do not reflect a full year of revenue or employment, but we estimate from its quarterly returns that annual revenues will be about \$2.66 billion, and employment globally will be 7,500. We have no information to infer U.S. earnings but following competitors we assume 50% is based in the U.S. **Cloudflare** reports 51% of revenue is earned in the U.S., and we apply that ratio to employment. **Limelight** reports that it earns \$142 million of its global revenue of \$230 million in the U.S., and we apply that ratio to its global employment of 618 people. The 'All Other' category includes CyrusOne, QTS Data Centers, Coresite Realty, Cyxtera, Fastly, and Internap, and are estimated to contribute 4,900 jobs.

Table 3.3.4 Data Centers

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Equinix	\$2,228	3,490	94065
Akamai	\$1,735	4,330	02142
DuPont Fabros (Digital Realty)	\$1,530	1,000	94111
Rackspace Technology	\$1,300	3,400	78218
Cloudflare	\$215	600	94107
Limelight	\$142	296	85257
All Other	\$2,600	4,900	
Total	\$9,750	18,016	



Chapter 4: Support Services

This chapter contains firms that support infrastructure or consumer services.

4.1 Service Providers

A very substantial industry performs a range of services that bridge from the infrastructure to consumer services. Some of these enterprises are small. Some are one-person outfits, and many are independent. At the same time there exist very large firms designed to serve global clients. From evidence from the Bureau of Labor Statistics there are about 456,000 firms and sole proprietorships in this sector. Their report notes that some consolidation has occurred over the past five years, driven primarily by major players acquiring smaller competitors. However, the industry is still primarily composed of small businesses. Industry structure is expected to change steadily over the next five years, as rapidly evolving technology will continue to encourage new businesses with specialization in specific fields to enter the market.

4.1.1 Enterprise IT System Vendors

These firms serve the largest of clients, matching the footprints of their offices to the globally dispersed offices of their clients. Many of the relationships are several decades old, originating long before the internet in the complex multi-year systems integration projects required to implement enterprise resource planning software. While such projects continue, particularly in finance, insurance, and supply chains, innovations such as cloud services and big data analytics are creating demand for a different kind of internet project by the largest global enterprises. The innovations often originate in small venture-funded startups offering so-called 'point solutions' (specific narrow applications) which, if they thrive, are acquired by enterprise IT system vendors to give the startups access to the enterprise market. And instead of finding the decision makers in this market among corporate IT departments, they find them in divisions such as marketing and operations departments. In response, these enterprise IT vendors reposition as marketing and operations designers.

Our estimates of the proportion of the revenues of these firms that are due to the internet required careful separation of internet IT services from services that are independent of the internet, and market-making support from operational support. We relied where possible on segment information reported in Form 10-K filings, and, where not, on analogies with firms where filings or interviews gave us a basis for the distinction. We excluded firms and divisions of firms that serve government and military clients.



Oracle has maintained its leading position in internet-related cloud and licensing due in part to acquisitions such as NetSuite (cloud-based business finance, human resources, operations, and customer relations) and Aconex (construction collaboration) that expanded the markets it served, and in part because its marketing cloud and data cloud offerings have held their shares. Of global revenues of \$39 billion earned in three segments, cloud/licensing, hardware, and services, the first accounts for 85% and is our focus. The U.S. accounts for 45% of global sales, and we take market-making internet revenue to be 85% of total U.S. sales.

IBM's global revenue has declined by over 30% since 2012 to \$77 billion, as growth in its legacy businesses such as mainframes and storage systems has slowed and new strategic directions, cloud business, and its acquisition of the open-source enterprise software provider Red Hat (which includes Linux) have not fully compensated.³⁵ Consulting services, which support client digital transformation, remain important (57% of global \$77.2 billion revenue from Form 10-K filing). In 2016 we attributed 20.1% of global revenue to U.S. internet revenue. Now we estimate that U.S. revenue today is a similar share of global revenue, and employment follows the same pattern.

Accenture plc provides management and technology consulting services and solutions from headquarters in Dublin, Ireland. A subsidiary, Accenture Inc., provides computer system design, much of which is internet-related, and we use its revenues of \$34 billion and its 459,000 global employees as a better guide to contribution to the internet ecosystem than the parent company. Its revenues have grown 6% since our last report. We assume the U.S. proportion has not changed in that time when the U.S. workforce totaled 48,000,³⁶ but almost all now work on internet systems.

Adobe, along with Twilio, Box and Sinch, may not be perfectly placed in this sector, as their focus is enterprise customer communications and engagement, and it could be argued that they offer services closer to customer relationship management at enterprise scale. Adobe's SEC filings report income of \$7.45 billion from the Americas and we take U.S. revenue to be 80% of that number. The same filings report 52% of employment as U.S.-based.

Capgemini, a French-headquartered company, is representative of how digital and cloud consulting and services have grown for firms that once were systems integrators. From 2014 to 2021, digital and cloud grew from 20% of revenue to 60%,³⁷ though half were in the public sector and manufacturing, automotive, and life sciences, so we take 30% of global revenue to be in market-making. Global revenues were \$13.2 billion in year ended 2019, a third in the U.S. Of 212,000 global employees, 120,000 are in India, and we allocate the difference on the same basis as revenues.



Cognizant global revenues were \$16.7 billion, of which U.S. revenues were 36%. Contributions to the market-making Internet ecosystem were estimated to come mainly from travel and communications clients, and little from medical and financial services, suggesting about 40% of revenues are relevant to this study.

Twilio is a cloud communications platform that provides developers with a user-friendly application programming interface (API) that enables real-time customer engagement. The company's SEC filings indicate that \$1.28 billion of revenues were attributable to the U.S. in 2020 and that U.S. employment was 2,900.

Atos Syntel is comparable to Cognizant, but outsources 80% of its workforce to India. For **CGI Technologies and Solutions**, the U.S. subsidiary of a Canadian parent, we rely on an industry analyst's report.³⁸ **Box** is a cloud-based content management platform serving two-thirds of companies in the Fortune 500. Its Form 10-K reports \$554 million in U.S. revenue and we attribute 96% of the company's headcount to the U.S., for our estimate of 1,857.³⁹

The merger of the enterprise services division of HP with Computer Sciences Corporation created **DXC Technologies** in 2017. Of its most recent annual revenue of \$14.2 billion, 40% is earned in the U.S. but we estimate that while most is data-related, no more than 10% relates to market-making.

Sweden-headquartered **Sinch** is billed as a cloud communications platform as a service (PaaS) company for the enterprise sector. To better compete with firms such as Twilio, Sinch acquired Atlanta-based Inteliquent in early 2020, with Atlanta serving as the company's U.S. hub. We attribute \$432 million to U.S. revenue and 889 employees.⁴⁰ Germany-based **SAP** provides enterprise software, much of it cloud-based, but much more of its revenue comes from efficient management of business operations than customer relations. Of its \$2.6 billion of U.S.-based revenue we assign only 10% to market-making.



Table 4.1.1 Enterprise IT System Vendors

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Oracle	\$15,800	54,600	78741
IBM	\$15,500	54,000	10504
Accenture	\$14,800	50,900	60601
Adobe	\$5,960	11,708	95110
Capgemini North America	\$1,868	9,100	10003
Cognizant	\$1,440	25,000	07666
Twilio	\$1,280	2,900	94105
Atos Syntel	\$830	4,400	48083
CGI Technologies and Solutions	\$740	6,065	22030
Box	\$554	1,857	94063
DXC (merger of CSC and HP Enterprise)	\$500	3,800	22102
Sinch (acquired Inteliquent)	\$432	889	30328
SAP America	\$260	1,300	19073
Unisys	\$280	2,140	19422
All Other	\$3,000	7,500	
Total	\$63,244	236,159	



Our estimate for enterprise systems vendors is \$56.73 billion and 222,594 jobs. The sector’s size today is not materially larger than in our 2016 report. The firms have all worked, by acquisition and retooling, to manage the transition from systems integration to cloud services provision, but they have met competition from incumbent cloud hosts like Amazon, Microsoft, and Google, and new entrant specialist software-as-a-service (SaaS) firms.

4.1.2 Enterprise Service Providers

Practices in this category grew either from origins in accounting and auditing or strategy consulting. They provide a wide range of IT and other consulting services, and we estimate the proportion of their employment that depends on the internet and is U.S.-based.

The largest firm in this category of analysis is **Insight Enterprises Inc.**, an IT consulting firm founded in the late 80s that has grown considerably through the acquisitions of companies such as Calence, Ensynch, DataLink, and PCM. Based on a review of Insight’s SEC filings we attribute \$5.93 billion of revenue as U.S.-based, and employment of 7,847.⁴¹

Deloitte is the largest of the management consulting firms. It signaled a serious interest in marketing strategy consulting in 2016 with the acquisition of a digital ad agency⁴² claiming \$1.5 billion in revenue.⁴³ Of its global revenue of \$47 billion, 47% is earned in the U.S. and 52% is from consulting services. We estimate that half of that, or \$5.7 billion is internet related. A similar ratio is applied to the global employment of 312,000.

A similar share of global revenues of EY (formerly Ernst & Young) of \$37.2 billion are earned in the U.S., with 28% from advising services and one quarter of that in internet-related consulting. The employment of just short of 300,000 are allocated in the same proportions. Among the other major accounting practices, none has a comparable revenue stream in internet services.

PwC (formerly PricewaterhouseCoopers), with global revenues of \$42.4 billion, acquired a digital analytics firm and a social media listening firm in 2012, and the commercial arm of Booz Allen Hamilton in 2013. The Americas contributes \$17.4 billion of this revenue (assumed 80% is U.S.) and advisory services contribute 33% of revenue. But internet-related consulting is a small proportion of advisory work, which we estimate at 20%. We estimate relevant revenue to be \$0.9 billion and we apply that fraction to global employment of 276,000.

Management consulting firms, organized mainly as partnerships, do not publish revenue information. Exceptions are **Boston Consulting Group**, which reports global revenues of \$8.5 billion in 2020 and 21,800 employees, and **Booz Allen Hamilton** at \$7.4 billion and 27,000 employees (but it reports that only 5% of revenue is from non-public sector clients.) An industry newsletter⁴⁴ estimates **McKinsey & Company** revenue at \$10 billion and **Bain & Company** at \$5.5 billion. From an industry report on consulting,⁴⁵ we estimate that internet-related consulting contributes 30% to revenue unless otherwise



noted. We work with these incomplete indicators to produce the entries in the table below, which are approximate.

Also included in this category are **Verint**,⁴⁶ a global company whose software and hardware products are used for the management of customer engagement and data management, enterprise security, and business and cyber intelligence, and **Dropbox**,⁴⁷ a provider of document syncing and storage for 700 million users in 180 countries.

Table 4.1.2 Enterprise Service Providers

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Insight Enterprises	\$5,930	7,847	85283
Deloitte	\$5,740	37,000	10112
McKinsey & Company	\$1,410	9,160	10007
EY	\$1,220	9,800	10036
Boston Consulting Group	\$1,200	3,080	02210
Dropbox	\$999	2,346	94158
PwC	\$900	5,800	10017
Bain & Company	\$780	2,030	02116
Verint	\$555	3,250	11747
Booz Allen Hamilton	\$100	400	22102
Total	\$18,834	80,713	



4.2.1 Researchers

Firms in this category produce industry-specific research and competitive analysis reports on topics related to information technology, appealing primarily to those holding positions such as CIO, CTO, and CMO. Custom research and consulting is also offered, as well as conferences, workshops, seminars, and webinars aimed at keeping industry personnel up to date with the latest developments in IT, and to assist executives with IT-related decision making. We take their consulting to be almost entirely derived from developments in the internet ecosystem, with 78% from the market-making internet following analyst reports on the consulting industry.⁴⁸

The largest firms in this industry are Gartner, Forrester, and IDC Technologies. **Gartner** is the industry leader, with global revenues of \$4.2 billion and 16,700 employees in 2019. It reported \$2.7 billion in U.S. and Canada, and employment of 8,433, so we assume U.S. revenue alone is \$2,46 billion and U.S. employment is 7,600. We assume 78% of these numbers to be attributable to the market-making internet.

Forrester reported global revenue of \$461 million in 2019 with employment of 1,795, of which 21% was outside the U.S. We assume that 50% of the U.S. revenue is attributable to the market-making internet, based on its services description.

IDC is the consulting subsidiary of the \$2.56 billion International Data Group, which is one of the leading publishers of technology books and magazines. The consulting subsidiary is estimated to have revenues of \$386 million and to employ 2,000 people.⁴⁹ We ascribe 1,000 of these people to the market-making internet, and a similar proportion of revenue. There are other firms in the sector such as Constellation Research and 451 Research, but we do not assume a long tail in this sector because reputation depends on size, so employment of only 1,500 people is added to our estimate.

Table 4.2.1: Researchers

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Gartner	\$1,920	5,930	06902
IDC	\$193	1,000	95035
Forrester	\$182	710	02140
All Other	\$480	1,500	
Total	\$2,775	9,140	



4.2.2 Domain Registry and Web Hosting Services

The size of the Internet is measured by its address space. Each address is identified twice, by an ordinary-language name like IAB with a domain name like .com, and with a string of numerals known as the IP address. The supply of ordinary-language names is generated by the non-profit ICANN but distributing them has been delegated to private companies. While distributing internet addresses is not itself very profitable, the distributors have added a range of ancillary services, such as web hosting, email hosting, build-your-own website services, and others, which accounts for much of the growth in domain registry employment and revenue. Proprietary industry research reports for the domain registry industry had U.S. revenues of \$6.6 billion in 2020⁵⁰ and web hosting had U.S. revenues of \$28.9 billion in the same year.⁵¹ Firms that we have classified as web hosting firms offer a broader assortment of services to small to medium businesses, which can include domain name registry but is offered together with website design and hosting, web security, and such ecommerce tools as search engine marketing and search engine optimization. The largest firms in this sector are Google, Facebook, and Microsoft, which are counted in the 'Integrated Firms' chapter.

Of the remaining independent (non-integrated) firms, **GoDaddy** is the largest. In 2020 it acquired the domain name registry business of Neustar, so Neustar was moved out of this sector. It reports U.S. revenue of \$2.21 billion. It reports that all its 6,621 employees are based in the U.S. and Europe. While 66% of revenue originates in the U.S., we take it as likely that more of its employment is in the U.S. We estimate that 75% of employment is in the U.S.

Endurance International concentrates on web hosting more than domain registration. It grew by acquisition of smaller web hosting businesses such as Bluehost and Hostway, moving much of its IT employment to India. In 2020 it sold some of its subsidiaries to Web.com. **Ionos by 1&1**, a subsidiary of the German firm United Internet, has a large presence in the U.S. **Verisign**, which holds exclusive rights to distribute the .com domain name, reports 65% of its revenues as generated in the U.S., and we assume 75% of its employment of 872 are there as well. **Web.com Group** has the third largest number of .com registrations under management across itself and its subsidiaries Network Solutions, Register.com and others internationally. As a private company we know little beyond revenue of \$750 million and employment of 3,500 internationally, with operations in Argentina, Canada, and the UK. We assume U.S. revenues and employment are 80% of global totals.

Squarespace combines web design, hosting, and registry sales. In 2021 it filed for an IPO, from which current U.S. revenue was taken.⁵² We estimated U.S. employment at the same percentage of global employment as of revenue. We make an allowance for all-other firms, including Weebly (owned by Square), Wix, and an estimated total of 140 firms,⁵³ and taking account of the proprietary industry reports previously mentioned, after deduction for the share controlled by integrated firms.



Table 4.2.2 Domain Registry and Web Hosting Services

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
GoDaddy	\$2,210	4,965	85260
Endurance International Group	\$1,200	350	01803
1&1 Ionis	\$1,100	2,000	19087
Verisign	\$780	650	20190
Web.com Group	\$600	1,700	32256
Squarespace	\$430	780	10014
All Other	\$6,000	20,000	
Total	\$12,320	30,445	

4.2.3 Other Vendors and Consultants

The U.S. is home to a great many vendors and consultants supplying support services to the Internet economy besides the large firms and partnerships enumerated above. Some are niche vendors and others are firms with potential to become large players in the future, for example HashiCorp, which develops software for building and running applications on multiple cloud providers, and Confluent, a streamed data platform. An analyst’s report estimated that the revenues of the entire IT consulting industry were about \$459.7B.⁵⁴ This study identified the four largest in the industry as Accenture, Dell, Hewlett Packard Enterprises, and IBM, all of which we have counted above, and which generate U.S. internet-relevant revenues of \$80.6 billion. Deducting their revenues from an estimate provided by proprietary industry information, we are left with \$379.1 billion which needs to be divided between internet-related work and other consulting. The following client sectors have been identified:

Financial services	22.0%
Public sector and non-profit	20.9%
Manufacturing and retail	20.3%
Communications and media	14.1%
Healthcare	11.9%
Other	10.8%



We exclude public sector and healthcare, based on our definition in Chapter 1 of the market-making internet ecosystem, and assume that internet consulting was a higher proportion of revenue in enterprise consulting firms than in smaller, particularly sole proprietor firms (web design being separately tracked) and arrived at an estimate of about \$180 billion for other IT vendors and consultants. It is a large number, but it is an important part of the digital transformation of the U.S. economy.

Table 4.2.3 Other Vendors and Consultants

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees
Other IT consultants and vendors	\$180,000	404,000

4.3 Software Vendors

4.3.1. Business Intelligence

Business intelligence (BI) deals with the extraction of managerial insight from data internal to an enterprise, in contrast to competitive intelligence whose data are external. As the source data for BI is drawn from the internal operating and financial systems of the firm and can be stored in and transmitted among local intranet systems, it is reasonable to ask why BI firms are relevant to this study of the internet ecosystem. If the firm used its own proprietary processes, the activity would not be a market-making activity and would not fit. But the firms analyzed here all market services to customer firms, so it meets that test from Chapter 1. Further, even though their products work with data internal to the customers, the data move on intranets (including ethernet) and intranets rely on the internet protocols to travel internally and to cross network boundaries.

Despite acquisitions that have removed firms from this sector since our 2016 report (Tableau to Salesforce, Amiato to Amazon, Hortonworks to Cloudera, and Looker to Google), and growth of BI in firms covered elsewhere (Microsoft, IBM, and Teradata), the sector has grown rapidly since our last report. This section identifies the largest of the firms not covered elsewhere.



Splunk earned 65% of its 2020 revenue of \$2.23 billion in the U.S., and we assume that 70% of its employment is in the U.S. **Teradata** is a multicloud data warehouse platform focused on enabling real-time business intelligence. The company's public filings report 50% of global revenues of \$1.83 billion, or \$918 million, as U.S.-based and 30% of global headcount of 7,543, or 2,263 as U.S.-based. **Palantir** only became a public company in September 2020, but revenue can be inferred from quarterly filings, in which U.S. revenues are given as 58% of global revenues. **Cloudera** earned 60% of its global revenue in the U.S., and we assume that 65% of its employment is U.S.-based.

Snowflake is a cloud platform that has differentiated itself with multiple scalable and available on-demand, in real time services for data warehousing and analysis. The company's public filings report \$499 million in U.S. revenues for 2020 and we attribute 1,647 of its employees to the U.S.⁵⁵ **Qlik** was taken private in 2016, so its revenue and employment are taken from estimates. As a company founded in Sweden and strong in the EU, we assume U.S. revenues and employment are about 50% of global revenue and employment estimates.⁵⁶ For **Tibco** and **Alteryx** we take U.S. revenues to be 65% of global, and employment 70%. **Varonis**, though nominally a data security company, uses metadata from client IT infrastructure to perform BI analyses. Its U.S. employees are 755 of a global employment count of 1,719, and we apply this ratio to its 2020 global revenue of \$293 million. **Databricks** offers a unified platform for data and AI and has forged strategic partnerships with such large firms as Microsoft, Amazon, and Tableau. Its 2020 revenue was \$425 million of which we estimate half, or \$212 million, is from the U.S. We also attribute half of its workforce, or 1,000 employees, to the U.S.⁵⁷ **Domo** reports that revenue from customers with U.S. addresses is 76% of annual revenue. We use this ratio to estimate U.S. source revenue and apply 85% to employment.

The 'All Other' segment is large, including Sisense, an Israeli company with a global revenue run rate of \$100 million, LogRhythm, Rubrik, Moogsoft, and Workiva. Our estimate is that they contributed \$500 million revenue and 1,200 employees.



Table 4.3.1. Business Intelligence

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Splunk	\$1,450	4,550	94107
Teradata	\$918	2,263	92127
Palantir	\$638	1,440	80202
Cloudera	\$521	1,950	95054
Snowflake	\$499	1,647	94402
Tibco	\$398	1,800	94304
Qlik	\$375	1,250	19087
Alteryx	\$321	1,015	92612
Databricks	\$212	1,000	94105
Domo	\$160	646	84003
Varonis	\$128	755	10001
All Other	\$500	1,200	
Total	\$5,621	17,869	

4.3.2 Customer Relationship Management Software

Customer relationship management (CRM) software helps firms manage interactions between the firm and its customers and prospects. Since 2016 the sector now includes customer data platform (CDP) software to store digital customer data for use in programmatic advertising. CRM tends to be a tool used by sales teams and CDP by digital marketers, but there is overlap in functionality. Industry trade associations suggest that the CRM sector has revenues of about \$43 billion and CDP about \$1.5 billion as of 2021.⁵⁸ About 30% of this revenue goes to large firms covered elsewhere (Oracle, SAP, and Microsoft).⁵⁹



Salesforce offers a range of enterprise CRM applications in customer service, marketing automation, analytics, and application development that it labels Commerce Cloud, Sales Cloud, Service Cloud, Data Cloud, Marketing Cloud, Community Cloud, Manufacturing Cloud, Analytics Cloud, App Cloud, Vaccine Cloud, and IoT. A notable recent acquisition is Slack. It reports Americas' revenue, and we take U.S. revenue to be 90% of this number.

Concentrix acquired the assets of Convergys while a subsidiary of Synnex, and then separated from the parent in December 2020 to offer enterprise customer experience services globally. It earns 78% of revenue outside of the U.S. **Thryv**, with roots in Yellow Pages, targets small business customers and offers several software products besides CRM, but we list it here because the range of services, generating new business leads, managing SMB customer relationships, and running day-to-day operations, have CRM as the common thread. We reduced reported revenue and employment by 15% to allow for a small vestigial print business and international operations. **CSG International** reports that most of its revenue originates in the U.S. and we assume that applies too to global employment, sourced from D&B Hoovers. **LogMeIn**, a SaaS and cloud-based provider of remote work tools for collaboration, IT management, and customer engagement was sold to a private equity firm in December 2019, therefore no public filings are available for 2020. The last reported global figures were \$1.26 billion in revenue and 3,974 employees in 2019. We benchmark using competitors and assume half of both are U.S.-based.

Zendesk reports 48% of its revenue is from outside the U.S., and its Americas revenues. employment is 3,570, of which we assume 90% is in the U.S. **Genesys Telecommunications Laboratories** was taken private in 2012, limiting our access to information. We rely on a modeled estimate of operating statistics from D&B Hoovers. **HubSpot**, a global mid-market CRM supplier, reports 57% of revenue is generated in the U.S. It reports employment for North and Latin America at 66% of global employment, so we assume 60% is the U.S. employment. **Pegasystems** develops software for enterprise customer relationship management, digital process automation, and business process management. It reports that 43% of its employees are in the U.S. We apply that proportion to its global revenue.

ZoomInfo provides business-to-business (B2B) market intelligence cloud software on a subscription basis for sales, marketing, and recruiting professionals. Its SEC filings report \$433 million in 2020 U.S. revenue and 1,520 U.S. employees. **Sprinklr** manages customers over social media channels. It reports 34% of revenue originates outside of the Americas. **Zoho** is an India-based CRM provider with free and premium offerings, with much of its employment in India. We rely on D&B Hoovers for a modeled estimate of U.S. revenue and employment. The industry has a very long tail of smaller firms that include Keap, Harte Hanks, Kustomer, Bigin, and Freshworks, so based on our estimate of total industry size we allow \$10 billion in revenue and 35,000 in employment for firms smaller than those enumerated individually.



Table 4.3.2 Customer Relationship Management Software

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Salesforce	\$13,262	32,830	94105
Concentrix	\$1,038	4,000	94538
Thryv	\$942	1,967	75261
CSG International	\$857	3,718	80111
LogMeIn	\$630	1,987	02210
Zendesk	\$536	1,989	94103
Genesys	\$500	1,000	94014
Hubspot	\$459	2,535	02141
Pegasystems	\$435	2,476	02142
ZoomInfo	\$433	1,520	98660
Sprinklr	\$255	990	10001
Zoho	\$132	1,200	94588
All Other	\$10,000	35,000	
Total	\$29,479	91,212	



4.3.3. Network Security

This segment comprises firms that create software that aims for security on online networks. We combine two segments, security for enterprises and security for consumer devices, in this section. It is estimated to be a \$16 billion market in the US.⁶⁰ Many offerings have expanded beyond device security to online privacy and identity protection. Security technology has evolved radically since the antivirus era, and, although brand names have persisted, the firms supporting the brands have changed. For example, the McAfee brand was acquired by Intel in 2016 to make chip-level insights to become part of security design, then spun into an independent company owned jointly by Intel and a private equity investor. Symantec, largest in our 2016 report, sold its enterprise security business to chip manufacturer Broadcom at the end of 2019, and rebranded its consumer business as NortonLifeLock. Broadcom's contribution to network security is therefore included in Chapter 3, where its enterprise security revenue, \$2.3 billion reported just prior to the acquisition, is subsumed in Broadcom's \$8.9 billion overall revenue.

Citrix sold its GetGo subsidiary to LogMeIn. Post-sale it reports 49.5% of global revenues as U.S.-based, and 46% of employment. **NortonLifeLock** reports sales in the Americas of \$1.827 billion, of which we assume 90% is U.S. sales, and gives its U.S. employees as 1,216. **Micro Focus** is an enterprise software firm with an emphasis on data security, headquartered in the UK but reporting U.S. revenue of \$1.3 billion. **McAfee** reports global revenue of \$2.96 billion and employs 6,916 people, of whom 43% are U.S.-based. We apply that percentage to calculate U.S. revenue. McAfee has announced intention to sell its enterprise division, but that transaction is not reflected in these numbers. **Fortinet**, whose most recent reported income was \$2.6 billion, earns 31% in the U.S. **FireEye** provides cybersecurity control products, software-as-a-service solutions, managed services, and professional services related to cyberattacks. **F5 Networks** offers application delivery networking and application security software. It reports that 56% of its revenue and 55% of employment are U.S.-based.

Significant players in this industry are Cisco, Google, and Microsoft, analyzed elsewhere, plus several firms based outside of the U.S. generating U.S. revenues not large enough to call for individual enumeration (Avast, Avica, Kaspersky Labs, and Trend Micro) and a long tail of smaller firms including Barracuda Networks and Gigamon. We estimate that U.S. employment of these smaller firms add 30% to the individually enumerated firms' U.S. revenues and employment.



Table 4.3.3 Network Security

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
NortonLifeLock	\$1,644	1,216	85281
Citrix	\$1,601	4,140	33309
Micro Focus	\$1,289	1,600	84606
McAfee	\$1,250	2,973	95002
F5 Networks	\$1,221	3,360	98104
Fortinet	\$813	2,636	94086
Proofpoint	\$700	2,560	94085
FireEye	\$585	1,938	95035
All Other	\$2,500	6,100	
Total	\$11,603	26,523	

4.4 Marketing Support

Advertising in digital environments takes many forms. Its oldest and most straightforward manifestation is as banner, display, or search ads, all of which derive from earlier media models, such as print ads, television commercials, and Yellow Pages advertising. Another form of online advertising is content marketing, which is content that satisfies user queries with enhanced information, sometimes referred to as ‘pull marketing,’ as it pulls in users with more relevant content, as opposed to the ‘push nature’ of other forms of reaching potential customers. Branded content and native advertising are two related, though not identical, forms of online advertising. Both aim to provide entertaining, informative brand-supported content, but reach the end user in distinct ways and formats. Branded content can appear as, for example, a podcast series on decision-making that is underwritten by a financial services firm. Native advertising is presented in the visual and thematic context of the publisher’s website or app on which it appears.

Examples of native advertising include a series of Spotify playlists tailored to reflect the tastes and personalities of characters on the Netflix series *Stranger Things* and a taco filter on Snapchat that let users put their faces onto taco shells, which was a Cinco de Mayo promotion used by Taco Bell. There’s also sponsored content, which may appear as an ad in your Twitter feed or as a mention, review, or



product placement within a post on YouTube, Instagram, TikTok, Twitch, etc. Another form of digital advertising is influencer marketing, which employs digital native celebrities (and even regular people) who have developed followings on such social media platforms as Facebook, Twitter, Instagram, TikTok, and YouTube to showcase branded products and services.

The firms and technologies that make these services available—advertising agencies, ad networks and exchanges, data and analytics companies, and measurement firms, as well as self-employed web programmers, designers, writers, and social influencers—are examined in this section.

The tables that follow in this section analyze the firms in both the traditional terrain of ad agencies as well as those involved in ad tech activities such as programmatic selling and buying and data and analytics.

4.4.1. Advertising Agencies: Full Service

The internet dominates advertising, mainly because people give so much of their attention to internet media and advertising follows their attention. Global advertising spending last year was over \$563 billion, of which just over half, or \$243 billion, was spent in the U.S.⁶¹ U.S. digital advertising totaled \$124.6 billion in 2019, an increase of 15.9% over 2018.⁶²

Firms owned by advertising agency holding companies manage the spending of much of this \$124.6 billion, on behalf of brands. They provide the research, strategy, tools, media buying, and creative services. The agency holding company sector has five dominant firms, each with a long list of subsidiaries involved in functions ranging from media planning and buying to research, public relations, digital advertising, and direct marketing. Beyond these five firms—WPP, Omnicom, Publicis, Interpublic, and Dentsu—smaller firms such as Havas, Hakuhodo, and MDC Partners, and thousands of boutique and specialist agencies in the U.S. manage the other 12%. We individually analyze the revenue and employment of the top five agencies and then provide an estimate for the ‘All Other’ category.

The largest of the agency holding companies by global revenue is **WPP** with 24% market share. Its subsidiaries include Grey, GroupM, Hill + Knowlton, Ogilvy, and Kantar. The company’s annual filing reports \$17.3 billion in global revenue, of which \$6.3 billion is recorded as North American revenue. We use the formula applied elsewhere in this report (i.e., the U.S. represents 90% of North American revenue) to arrive at our estimate of \$5.7 billion for U.S. revenue. Our estimate of \$2.96 billion for U.S. internet-dependent revenue is derived from calculating overall U.S. revenues at 52%, the ratio noted above. We apply the same formula to determine U.S. internet-dependent employment as 10,073.

The next largest agency holding company, with 21% market share, is the **Omnicom Group**, which houses BBDO, DDB, TBWA Chiat/Day and others, along with subsidiaries that specialize in areas such as public relations, package design, retail design, and corporate and crisis communications. Its U.S. internet-dependent revenue and employment are estimated at \$1.987 billion and 6,057 jobs respectively



and are based on the company’s annual filing and established industry benchmarks.

The third of the major agencies we analyze is **Publicis** which enjoys approximately 16% market share of the global advertising market. The company’s annual report cites global revenue of \$11.2 billion and global employment of 80,000 for 2020. In the U.S., following the acquisition of Epsilon, we estimate Publicis’s U.S. digital revenue to be the largest of the five.

The **Interpublic Group of Companies** (IPG) accounts for just over 13% market share. Falling under the IPG umbrella are McCann Worldgroup, Foote, Cone & Belding (FCB), MullenLowe Group, IPG Mediabrands, and a variety of agencies servicing specific sectors such as sports, healthcare, and talent representation. IPG’s data and technology-focused subsidiaries include Acxiom and Kinesso.

Japan-headquartered **Dentsu International**, previously known as Dentsu Aegis Network holds just over 13% market share. Dentsu’s agencies include Carat, Merkle, mcgarrybowen, 360i, and others. Since the time of our last report four years ago the firm’s acquisitions include Novus Group, M8, and Global Mind. For our estimates of revenue and employment we calculate the proportion of overall U.S. to global revenues and attribute the industry benchmark of 52% for digital advertising to arrive at our estimate of U.S. internet-dependent revenue of \$1.04 billion and U.S. internet-dependent employment of 7,788.

Table 4.4.1. Advertising Agencies: Full Service

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Publicis ⁶³	\$3,080	10,045	
Interpublic Group of Companies (IPG)	\$2,990	9,749	10022
WPP ⁶⁴	\$2,960	10,073	1007
Omnicom Group ⁶⁵	\$1,987	6,057	1002
Dentsu International	\$1,043	7,788	10017
All Other	\$1,447	5,245	
Total	\$13,507	48,957	



4.4.2 Ad Tech

This section examines the technologies that enable efficiencies in the buying and selling of online advertising inventory at scale. The general term for these technologies is ad tech. Among the technologies that exist under the umbrella of ad tech are ad networks, ad exchanges, demand-side platforms (DSPs), supply-side platforms (SSPs), data management platforms (DMPs), and customer data platforms (CDPs).

Such digital tools and virtual marketplaces are necessary in the online environment where millions of ad placement opportunities emerge each minute and the scale can only be handled by sophisticated segmentation and targeting technologies and real-time bidding systems.

The ad tech sector also functions as an R&D incubator. Thousands of companies are started up, and most are absorbed by others or consolidated. The past year witnessed a flurry of mergers and acquisitions as the industry seeks out large firms that operate across as many platforms as possible and as globally as possible. Recent M&A activity in this sector included:⁶⁶

- Rubicon Project and Telaria merged to form Magnite
- Magnite acquired SpotX from RTL Group
- Experian acquired Tapad
- Twitter acquired CrossInstall
- FreeWheel (Comcast) acquired Beeswax
- Roku⁶⁷ acquired Dataxu
- NextRoll became the parent company of AdRoll and RollWorks

In this section we individually analyze the top ad tech firms that are not part of larger firms reported elsewhere in this report, such as Google, Amazon, Microsoft, Oracle, and Salesforce. The individually analyzed firms are **AppLovin, Criteo, The Trade Desk, Magnite, NextRoll, Pubmatic, OpenX, and MediaMath.**

To account for the balance of small and startup firms operating in this sector we provide an 'All Other' estimate in the table below.



Table 4.4.2 Ad Tech

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Applovin ⁶⁸	\$885	500	94304
Criteo ⁶⁹	\$805	619	10016
The Trade Desk ⁷⁰	\$719	917	93001
Magnite ⁷¹	\$162	435	90094
NextRoll ⁷²	\$115	430	94110
Pubmatic ⁷³	\$97	198	95065
OpenX ⁷⁴	\$69	330	91101
MediaMath ⁷⁵	\$60	275	10007
All Other ⁷⁶	\$291	500	
Total	\$3,203	4,204	

4.4.3 Audience Measurement

The focus of companies analyzed in this section is market research and audience measurement. This includes companies that specialize in broadcast and/or digital measurement (e.g., Nielsen, Comscore) as well as companies that produce digital survey tools, generally available as software as a service (e.g., Momentive, formerly SurveyMonkey).

The largest firm in this sector is **Nielsen**, a brand synonymous with ratings. Nielsen operates in 90 countries and covers approximately 80% of the world’s population with measurement tools spanning broadcast, digital, mobile, and more recently streaming media. A review of the company’s SEC filings indicates that U.S. revenue is 59% of global revenues and we attribute 20% of revenues to internet-dependent activities, an increase of approximately 67% since our last study. Similarly, we attribute 20% of U.S. employees to internet-dependent work.

A top competitor for Nielsen is **Comscore**, whose platform compiles and combines data across mobile devices, computers, televisions, and movie screens. The company’s U.S. revenue for 2020 is reported as \$313 million and the U.S. employee headcount is 804.



The online survey company SurveyMonkey rebranded as **Momentive** in mid-2021. A pioneer in online surveys and market research using the freemium model (basic features for free, additional features at different payment tiers), the company had over 20 million active users in 2020, of which over 820,000 were paying users. The company reports 65% of 2020 revenue, or \$244 million as coming from the U.S., and U.S. employment of 892.

Next, we analyze **Quantcast**, a global company whose focus is real-time audience measurement and insights, driven by AI. Quantcast is privately held, so we rely upon figures from our previous study, industry estimates, and sector benchmarks to arrive at our figures in the table below.

The measurement and attribution sector, like the ad tech sector, is one where the scale of R&D and innovation is significant. Our ‘All Other’ category includes small SaaS survey providers such as Alchemer (formerly SurveyGizmo), SoGoSurvey, and Hotjar which are estimated to have annual revenues significantly below the \$100 million threshold we apply in our analysis throughout this study. We also note that firms that offer survey tools as part of a CRM/marketing automation package (e.g., CheckMarket/Medallia, Mailchimp, ConstantContact, and Qualtrics/SAP) are accounted for in the section of this report devoted to an analysis of their core business.

Table 4.4.4 Audience Measurement

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Nielsen ⁷⁸	\$740	2,060	10004
Comscore ⁷⁹	\$313	804	20190
Momentive (formerly SurveyMonkey) ⁸⁰	\$244	892	94403
Quantcast ⁸¹	\$156	480	94107
All Other ⁸²	\$290	847	
Total	\$1,743	5,083	

4.5 Operational Support

4.5.1. Financial Services Support

The firms examined in this section supply the supporting technologies, or back-office services, for the banking and investment industries. They provide software that assists with functions such as security, regulatory compliance, anti-fraud, and data and analytics to brick-and-mortar banks, digital banks, and



investment firms. Note that this section is separate and distinct from our analysis of fintech companies which focus on business-to-consumer (B2C) services, the companies analyzed in this section serve the enterprise, or business-to-business (B2B) side of fintech.

Digital transformation has been extensive in this industry, with the use of technologies that depend upon the internet permeating virtually every aspect of financial services support (e.g., digital payments, peer to peer payments, real time payments, cloud-based systems, and AI-powered fraud detection). Using a model like Amazon Web Services (AWS), many of these functions are provisioned on a SaaS basis, which streamlines operations, particularly for startup firms and new market entrants.

By far the largest firm analyzed in this section is **Fiserv**, the leading global provider of financial technology and payments solutions on a B2B basis. Since the time of our last study, Fiserv acquired FirstData, one of the earliest payment processing firms for credit cards. Other recent acquisitions include the fintech companies Ondot, Dovetail, and Monitise. Among Fiserv's innovative offerings is the cloud-based point of sale platform Clover, used extensively by small- to medium-sized businesses and ecommerce merchants, and allowing Fiserv to compete directly with Square and Shopify in the sector of payment processing for SMBs. In 2020 Fiserv reported \$12.9 billion in U.S. revenue and 27,000 U.S.-based employees. Our rationale for ascribing all U.S. revenue and employment to the internet is based on the current use of the TCP/IP internet protocol suite for virtually all transaction-based systems, in contrast to the use of proprietary software over private networks in this sector at the time of our earlier reports.

SS&C Technologies, a global provider of internet-enabled software that integrates front-office functions (e.g., trading), middle-office functions (e.g., portfolio management), and back-office functions (e.g., processing, clearing, and accounting) is the second largest firm in this section. SS&C also earns income from licenses and training, though software services represent 83% of the firm's global revenues. 73% of revenues from software services are realized in the U.S. and our estimate of \$2.84 billion and 17,958 employees for their U.S. operations are based on these ratios. Next, we analyze **ACI Worldwide**, the company behind \$14 trillion in payments and transactions that move around the world each day. ACI's financial filings indicate that approximately 90% of revenues are in the U.S., leading us to our estimate of \$1.15 billion in U.S. internet-dependent revenue, with the same rationale for revenue being wholly internet dependent applied to competitors in this sector. Our employment estimate of 1,560 is based on the U.S. headcount representing 90% of the figure reported in the company's segment for the Americas.

MSCI (formerly Morgan Stanley Capital International) is another major global supplier of financial technology services, specializing in analytics for such areas as risk management, performance attribution, and portfolio management. RiskMetrics and Barra are among MCSI's B2B brands. The company's most recent Form 10-K filing reports \$1.248 billion in subscription revenue for these services, of which 43%, or \$537 million, is allocated to the U.S. 763 employees are reported as based in the U.S. and Canada. We allocate 90% of this figure, or 687, to the U.S.



Investnet serves 17 of the 20 largest U.S. banks and 47 of the largest wealth management firms with cloud-based software, AI, and data and analytics services. Subscription revenues for cloud-based and data and analytics services provided by Investnet were \$426 million in 2020. Investnet outsources approximately 60% of its employment base to India and reports a U.S. headcount of 1,615 for 2020. Providing what some term 'banking in a box' solutions is Austin-based Q2. Q2 supplies thousands of fintech and 'alt fi' (alternative finance, such as peer-to-peer lending platforms and non-bank lending) with the modular technology that helps them build and scale their businesses and provide digital banking customers with a seamless, user-friendly interface. At the end of 2020 Q2's digital banking platform served customers in 48 U.S. states and accounted for the execution of over \$1.4 trillion in transactions. We estimate 1,520 U.S.-based employees and U.S. revenue of \$266 million, based on comparable ratios for U.S. to global revenue seen elsewhere in this sector.

Bottomline Technologies, a provider of cloud-based systems for payments, payment processing, and fraud detection to the financial services, healthcare, insurance, retail, manufacturing, and government sectors, is examined next. Its most recent public filing indicates \$442 million of global revenue, of which 63%, or \$277 million is U.S.-based. We estimate U.S.-based employment using this ratio to arrive at the estimate in the table below.

As **Finastra USA** is a private company servicing financial institutions with back-office software for functions such as CRM and BI, we do not have access to detailed financial statements, and therefore estimate two thirds of publicly reported revenue and employment to be U.S.-based.

The publicly traded **Cantaloupe** was known as USA Technologies at the time of our last report. The firm provides cloud-based payment services for retail, warehouse management, kiosks, vending machines, and the internet of things (IoT). Cantaloupe's systems use LTE connections to access the internet to enable payment acceptance, remote monitoring, and reporting. The company reported \$163 million in revenue for 2020 and 140 employees. As Cantaloupe operates in the U.S. and Canada, we take 90% of revenues and employment as U.S. based to arrive at our estimates of \$147 million in U.S. revenue. We assume all employees are U.S. based.

Another privately held firm in this sector is **MeridianLink**. It serves banks, credit unions, mortgage lenders, and consumer reporting agencies with cloud-based software solutions. As the firm is planning to IPO, some financial information is publicly available, and we use those figures for our estimates that appear in the table below.

As noted above, financial services is a sector experiencing a burst of entrepreneurial activity. We therefore add an 'All Other' category and calculation to the table below to account for the firms in the B2B fintech sector that are either startups or satellite U.S. offices of companies headquartered outside the U.S. likely to have annual U.S. revenues of \$100 million or less such as Kasasa, Cross River, Temenos, and Joust (acquired by ZenBusiness in 2020).



Table 4.5.1 Financial Services Support

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Fiserv⁸³	\$12,900	27,000	53045
SS&C Technologies⁸⁴	\$2,847	17,958	06095
ACI Worldwide⁸⁵	\$1,150	1,560	34105
MSCI⁸⁶	\$537	687	10007
Investnet⁸⁷	\$426	1,615	60601
Q2⁸⁸	\$266	1,520	78750
Bottomline Technologies⁸⁹	\$277	1,260	03801
Finastra USA⁹⁰	\$154	858	97204
Cantaloupe Inc.⁹¹ (Formerly USA Technologies)	\$147	140	19355
MeridianLink⁹²	\$131	727	92626
All Other	\$3,767	10,665	
Total	\$22,602	63,990	

4.5.2 Online Learning Support

Not surprisingly, the technologies that support online learning represent another sector that has seen dramatic growth since the time of our 2016 report. At that time the firms that provided software for the management and delivery of course materials online were estimated to represent about \$800 million in U.S. revenue and just over 4,600 full time jobs. Our 2020 estimate for this sector is \$1.8 billion in U.S. revenue and 8,584 full time jobs.

There are estimated to be over 1,000 firms⁹³ that provide the cloud-based platforms known as learning management systems (LMS) to educational institutions and instructors. These technologies offer centralized management of course materials, discussion boards, attendance, and assessments and evaluations. Note that this section covers the B2B market for online learning, while the B2C learning management systems such as Udemy, Kajabi, Teachable, and Thinkific are accounted for in the section of this report that covers online learning.



During the COVID-19 pandemic the mainstreaming of online learning for K-12, post-secondary, corporate learning, personal interest learning, and skills upgrading became a necessity. This shift, coupled with the attractiveness and ease of use of software across desktop computers, laptops, iPads, and even phones contributed to the widespread acceptance of learning by screen as a viable alternative to the face-to-face, classroom experience.

Our estimate for this industry segment is a single figure anchored on the following inputs: Blackboard and Canvas are the industry leaders with a total of \$909 million in revenue and 4,292 employees. Both companies are U.S. based. Other large vendors are SAP and Oracle, covered elsewhere in this report. As mentioned above, there are over 1,000 LMS vendors, and several popular ones are open-source and not for profit such as Moodle, Sakai, and Edu-sharing. Our figure in the table below factors in a global market size of approximately \$9 billion, the market share of enterprise providers such as SAP and Oracle, the market dominance of the handful of large providers, and the long tail of smaller software providers.⁹⁴

Table 4.5.2 Online Learning Support

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees
Learning Management Systems (LMS)	\$1,818	8,584

4.5.3 Online Travel Services Support

One of the base technologies used by online and offline travel agents and distributors is the GDS, or global distribution system. The GDS is where travel industry providers find fares, schedules, and related inventory such as cruises, car rentals, and tour packages, and connect to them via APIs that enable the linking of one software system to another. There are three main GDS providers: Amadeus, Sabre, and Travelport.

Amadeus is the largest of the three. Its annual report states that 38% of 2020 revenues were U.S.-based. As it is an EU-headquartered company we estimate U.S. employment at a slightly lower ratio than U.S. to global revenue to arrive at our estimates in the table below. The next largest firm in this sector is **Sabre**. Its public filings report \$1.33 billion in global revenue for 2020, and we estimate that \$768 million of this revenue is U.S.-derived. We also attribute 2,404 U.S. employees to the company’s global headcount of just over 7,500. Rounding out this sector is **Travelport**, which also operates Galileo, Apollo, and Worldspan. Travelport was previously a public company, and then acquired by private equity firms in 2019. Therefore, there are no public filings for the company, so we rely on industry estimates and benchmarks to arrive at our estimates in the table below.



Table 4.5.3 Online Travel Services Support

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Amadeus ⁹⁵	\$980	4,138	75062
Sabre ⁹⁶	\$768	2,404	76092
Travelport ⁹⁷	\$500	800	30339
All Other	\$450	1,468	
Total	\$2,698	8,810	

4.5.4 Ecommerce Software

In this section we perform an estimate for ecommerce software, the technologies that underly business to consumer transactions conducted on the internet. The companies analyzed in this section offer technology solutions that range from plug-ins on WordPress sites and blogs to highly scalable omnichannel, multi-vendor systems.

Shopify is by far the largest firm in this category, but there are also mid-size and smaller providers such as WooCommerce, BigCommerce, Ecwid, CS.Cart, and PinnacleCart. Another popular maker of ecommerce software is Magento, which was acquired by Adobe in 2018 and is accounted for in our calculation of Adobe in the relevant section of this report.

Shopify is a proprietary ecommerce platform for sellers that allows anyone to have their own branded storefront, along with integrated payment, shipping, and marketing solutions. In 2020 the number of sellers on the platform grew to over 1.75 million sellers, up from approximately 1 million at the end of 2019, with 50% of the sellers based in the U.S.⁹⁸ According to the company’s annual filing we estimate that U.S. revenues for 2020 are \$1.95 billion, or 67% of global revenues. As Shopify is headquartered in Canada, we assume most employees are based there, and attribute 20% of the company’s employment to the U.S. where Shopify has offices in San Francisco and New York City.

The next largest provider in this category is **WooCommerce**, an open-source ecommerce plugin for WordPress. In 2020 WooCommerce powered online sales of over 4.4 million websites globally, representing \$20 billion in commercial activity. Overall WooCommerce sites represent 28% of the ecommerce market.⁹⁹ WooCommerce’s parent company is the privately held Automattic, which also owns WordPress, Tumblr, Cloudup, Jetpack, Longreads, Akismet, Crowdsignal and other apps and online companies.¹⁰⁰ Our estimates for U.S. revenue and employment (\$389 million and 100 employees)



are based on publicly reported figures benchmarked against competitors in this sector.¹⁰¹

The last firm individually analyzed in this section is **BigCommerce**. Its B2B and B2C ecommerce solutions are provided on a SaaS basis, greatly reducing the cost and complexity associated with onsite systems. BigCommerce is used by over 60,000 SMBs and more than 25 Fortune 1000 companies. The company’s annual filings report \$152 million in revenue in 2020, of which the U.S. portion is 80%, or \$121 million. 691 employees are U.S.-based.¹⁰²

Our ‘All Other’ category for this section provides an aggregate for the ecommerce software providers that serve hundreds of thousands of SMBs and represent approximately 40% of the ecommerce software market.¹⁰³

They include:

- CS-Cart – Customizable, multi-vendor software (e.g., eBay, Etsy, and Amazon).
- Ecwid¹⁰⁴ – Touted as the most popular add-on store builder for SMBs selling on websites, apps, and social media sites.
- PinnacleCart – A “turnkey solution that has become the top ecommerce platform for small-to-medium businesses.”¹⁰⁵

Table 4.5.4 Ecommerce Software

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Shopify ¹⁰⁶	\$1,950	1,400	94105
WooCommerce ¹⁰⁷	\$389	200	
BigCommerce ¹⁰⁸	\$121	691	
All Other ¹⁰⁹	\$1,640	1,500	
Total	\$4,100	3,791	

4.5.5 Shipping

There can be no doubt that the growth of ecommerce in general and as a response to the COVID-19 quarantine has led to substantial growth in employment in parcel shipping. But growth aside, it is extremely hard to say what part of this is due to the internet. All large shippers (USPS, UPS, and FedEx)



report growth in parcel volume and employment in 2020, and it is plausible to say that substantially all the growth can be traced to orders placed online. But there is no reliable evidence of how employment to fulfill orders placed online and employment to handle other shipments was divided before the pandemic. Also, many who work in shipping are contractors or work for fleet owners,¹¹⁰ and there is no way to attribute this employment to the internet versus other reasons to ship. Amazon is another large employer of people for shipment, but it is handled in the ‘Integrated Firms’ section. So, while the Bureau of Labor Statistics records total employment in shipping, there is no basis for allocating a share of that number to the internet. Therefore, we follow the method used in 2016, growing the employment and revenue in proportion to the growth in ecommerce.

Table 4.5.5 Shipping

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees
Shippers delivering online purchases	\$61,472	717,184

4.5.6 Designers, Programmers, and Writers

This section estimates the number of self-employed web and app developers, designers, programmers, and writers, whose work is not captured elsewhere in our study. In 2012 and, to a lesser extent 2016, there were many opportunities for freelance work of this kind, but by 2020 the number of jobs had begun to decline. The reasons behind the decline in these figures include freelance/contract work shifting to companies, the increase of SaaS products, which meant that firms could effectively ‘rent’ the technology solutions required for their operations vs. buying enterprise versions or having them created from scratch, and the rise of no-code development¹¹¹ which makes it possible to build tools, apps, platforms, and sites without writing a single line of code.

We relied in all cases on the U.S. Bureau of Labor Statistics’ Occupational Outlook Handbook for evidence of internet-related occupations with a high proportion of self-employment. The most recent study¹¹² reported three relevant categories. The first, writers and authors, has 131,200 workers, many self-employed, but few who work in internet-related fields. Following 2016 study logic, we estimate 16,268 work in internet-related jobs. The second, graphic designers, has 281,500 workers but a low proportion of self-employed people, and again we follow the 2016 study logic. The third, web developers and digital designers, has 174,380 workers, of whom about half are self-employed. We allow 40,000 for the ‘All Other’ self-employed workers to account for people in the app economy and digital marketing freelance jobs, noting that the Federal Trade Commission identifies 4.7 million people working in the app economy,¹¹³ but recognizing that most are accounted for elsewhere in our study.



Table 4.5.6 Designers, Programmers, and Writers

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees
Writers and Authors	\$1,090	16,268
Graphic Designers	\$996	18,671
Web Developers and Digital Designers	\$6,783	87,190
All Other	\$2,200	40,000
Total	\$11,069	162,129

4.6 General Enterprise Activity

Beginning with the 2008 study, we started tracking general enterprise omitted employment—that is, people working in large corporations and non-profit organizations who owed their jobs to the internet, but whose employers were not conspicuous members of the internet ecology. To study this somewhat shapeless sector, we performed detailed enumeration on about 260 firms and about 50 rolled-up firm groups and self-employed groups, out of the approximately six million firms in the U.S. large enough to have a payroll. Granted, many have no internet employees and others make internet duties a part-time responsibility of one person, but in 2008 we pegged general enterprise omitted employment relating to the internet at 100,000 people, in 2012 at 170,000 people, and 2016 at 390,000. Given that omitted employment should be proportional to growth in overall internet ecosystem employment, which has grown about sixfold since 2008, we estimated omitted employment to be 600,000 in 2020.

Table 4.6 General Enterprise Activity

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees
General Enterprise Activity	\$33,000	600,000



Chapter 5: Consumer Services

Earlier chapters have measured the infrastructure and enabling software of the Internet. These sections are largely not noticed by consumers, except when they fail. In this chapter we measure all those activities that consumers do see. Each day hundreds of millions of Americans access the millions of apps, websites, online tools, and streaming services that are delivered directly to them by way of the internet. It is these consumer touchpoints that define the internet for the average user. In the four years that have elapsed since our last study there have been many significant developments:

- 80% of global internet traffic now comes from three areas: video, gaming, and social media sites/apps.¹¹⁴
- In social media, Facebook has grown to over 2.5 billion monthly active users (MAUs), from 1.86 billion in 2016, and Snapchat has grown to 265 million MAUs, from 158 million in 2016.
- In music, Spotify has grown to 345 million global users, from 123 million in 2016.
- In video, Netflix has grown to over 200 million paying subscribers worldwide, from 94 million in 2016.
- Podcasting has approached \$1 billion in ad revenue, from \$170 million in 2016.

Also worthy of note for 2020 in digital consumer services:

- A new acronym and a new business model have developed for streaming video content: Free ad-supported streaming TVs or FASTs are a new option for households that are cord cutters or 'cord nevers.'
- Self-publishing, and subscription-based platforms such as Substack have grown in popularity for writers and journalists seeking an alternative to conventional employment or freelancing for ad-supported sites.
- Individual creators are becoming multi-platform media companies, using a variety of newly created enabling technologies, and working across online video, podcasts, email newsletters, endorsement deals, personal appearances, and traditional publishing such as books.

We now review the main sectors of consumer services.



5.1.1 News and Information

This section is comprised of the digital activities of such media industry cornerstones as Bloomberg, The Wall Street Journal, and The New York Times. These are the large legacy media organizations that have maintained strong positions in a highly dynamic media marketplace by adjusting their products, services, and business models to the digital environment.

Bloomberg, for example, long reliant for most of its revenue from the Bloomberg Terminal aimed at finance industry professionals, has branched out into consumer subscriptions for its content, reporting 250,000 such subscriptions for 2020 and forecasting 400,000 for 2021.¹¹⁵ In the case of **The Wall Street Journal**, global digital subscriptions for the Journal and its Barron's magazine accounted for \$2.8 billion of all revenue in the company's most recent 10-K filing. **The New York Times** continues to innovate with a suite of digital products, such as its podcast *The Daily*, that receives over four million downloads per episode,¹¹⁶ and its morning newsletter The Morning which has had over 1 billion unique opens since launching in May of 2020. The Morning is but one of The Times' 71 newsletters, which cover topics ranging from COVID-19 to politics.¹¹⁷ Our estimates for the internet revenue and internet-dependent employment of the top earning firms in this sector are in the table that follows, with citations and assumptions detailed in the footnotes.

Other notable developments in the sector of news and information online include:

- A return from free to paid content, which had been a norm of the analog world that is relatively new to digital content markets, with one industry estimate reporting that 25% of online content is now paid for by consumers.¹¹⁸
- The New York Times' digital revenue exceeded its print revenue for the first time in 2020, with over seven million paying subscribers representing an increase of 46% year over year.¹¹⁹
- Podcasts and podcast networks emerge as increasingly common digital offerings alongside digital print-based content, as is the case with Vox and The New York Times, both of which have popular print-based digital and digital audio products.

To calculate the long tail of this sector we used the following method. It is estimated that there are over 1,200 small news publishers in the U.S.¹²⁰ One firm we analyzed, Gannett, merged with GateHouse Media/New Media Investment Group in 2019, and has pursued a strategy of consolidating small news publishers to achieve advertising scale. Gannett accounts for almost half of the long tail in this sector with its 253 daily media brands and 308 weekly media brands reported in its 2020 10-K filing. We estimate the remaining firms in the long tail represent \$2.1 billion in revenue and 4,500 in employment.



Table 5.1.1 News and Information

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Bloomberg ¹²¹	\$8,000	12,600	10022
News Corp. ¹²²		5,552	10036
Fox Corporation ¹²³	\$3,040	4,864	10036
RELX Group (formerly Reed Elsevier) ¹²⁴	\$2,520	7,600	10169
Thomson Reuters ¹²⁵	\$1,947	2,726	94105
Gannett (parent company of USA TODAY) ^{126 127}	\$808	2,068	22102
New York Times Digital ^{128 129}	\$586	1,500	10018
WashingtonPost.com (parent company is Nash Holdings) ¹³⁰	\$387	1,000	20017
All Other ^{131 132}	\$2,100	4,500	
Total	\$22,858	42,410	



5.1.2 Digital Publishers

Digital-first media companies are the focus of this section, including some merged firms and aggregator firms such as Vox Media, home to digital brands such as The Verge, Recode, and Eater, and more niche publishers such as The Worldwide Knot, a group of sites specializing in content related to weddings and newlyweds.

While there are tens of thousands of digital publishers in the U.S., some being just single person enterprises, this section individually enumerates the top eleven based on revenue and adds 10% of the total to account for any omitted larger digital publishers. We account for the long tail of small digital publishers involved in such activities as online video, online audio, and newsletters in Section 5.3.3 on the creator economy.

Highlights of this section include:

- A new company at the top of the list: **Red Ventures**, a South Carolina-based firm that has been on a buying spree of a range of digital media companies since our last report: Bankrate.com, ThePointsGuy.com, Healthline.com, HigherEducation.com, CNET, and LonelyPlanet.com.
- **Vox Media** is now a top 30 media company in terms of U.S. users according to Comscore, emerging as a diversified media brand with its ownership of such properties as The Verge, Vulture, Eater, and Curbed, and its operation of the Vox Media Podcast Network.
- **Buzzfeed**, beset by layoffs of approximately 6% of its U.S. staff last year, almost quadrupled its revenues since our last report in 2016, and reinvented its formerly native advertising-based business model to one that includes a content network, platform revenue sharing, and commerce, with the latter driving over \$425 million in directly attributable transactions via its media brands such as Tasty (food), Nifty (Do it Yourself projects and money saving tips) and Bring Me (travel). Additionally, BuzzFeed acquired HuffPost from previous owner Verizon in late 2020.¹³³
- **Vice Media**'s revenues increased more than tenfold since our 2016 report, despite layoffs of 10% of its employees in early 2019¹³⁴ and its acquisition of Refinery29 in late 2019, a site that bills itself as the "leading global media company focused on young women." (We note Disney's written-down investment in Vice in the section on multi-genre and multi-platform content publishers.)
- This report marks the appearance of new and successful digital only and subscription only companies such as **The Information**. The Information boasts tens of thousands of subscribers in over 80 countries, publishing content daily and competing with such industry stalwarts as **The Wall Street Journal** and **The New York Times**. The Information achieved profitability in three years with a reported \$20 million in sales by the end of 2020.¹³⁵ Note that we capture this revenue in our calculation of All Other in the table below.



Table 5.1.2 Digital Publishers

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Red Ventures (CNET, ZDNet, Bankrate, Healthline, GameSpot, The Points Guy etc.) ¹³⁶	\$2,800	2,520	29707
Zillow	\$2,700	3,000	98101
Ancestry.com	\$619	1,300	84043
Vice ^{137 138}	\$600	2,046	11211
Buzzfeed ^{139 140}	\$300	827	10003
TrueCar ¹⁴¹	\$278	435	90401
The Knot Worldwide ¹⁴²	\$160	370	20815
Leaf Group (eHow, Livestrong and various lifestyle sites)	\$154	346	90404
Insider.com ^{143 144} (parent company is Axel Springer)	\$100	200	10006
Vox Media ^{145 146}	\$100	865	20036
Penske Media Corp. ¹⁴⁷	\$75	719	10017
All Other ¹⁴⁸	\$789	1,263	
Total	\$8,675	13,891	



5.1.3 Multi-Genre and Multi-Platform

This category is distinct from the previous categories of news and information and digital publishers as the firms analyzed here are not conventional news organizations; have their roots in the world of non-digital publishing and/or broadcasting; and have built out their business base to include digital channels such as the web, podcasting, mobile, and subscription and/or advertising-supported streaming. We note the continuing activities of companies from the analog terrestrial world of broadcasting and publishing adding digital entities to their portfolios such as Viacom, merged with CBS in December 2019 to become **ViacomCBS**, acquiring free ad-supported streamer Pluto, **Discovery** acquiring Scripps Interactive, and **Disney** embarking on a successful direct-to-consumer (DTC) offering.

Also of note in our analysis of this sector:

- Viewing of digital/streaming/connected TV jumped to 25% of all TV viewing in the U.S. by mid 2020 according to Nielsen, representing an increase of over 20% year-over-year.¹⁴⁹
- The appearance of multiple free ad-supported streaming TV services aka FASTs including Viacom’s Pluto TV, Fox’s Tubi, and **Univision**’s Vix and Prende TV. These FASTs satisfy budget conscious viewers looking for video entertainment they can access without a monthly subscription, as cord cutting grows among older Americans.¹⁵⁰
- Major moves at **Disney**, including its 2019 Disney acquisition of 21st Century Fox and most of its business units, its write-down of the company’s \$400 million investment in Vice, and its removal of its catalogue from Netflix and subsequent success with a DTC streaming service that reported over 95 million subscribers at the end of 2020.
- **Reddit**, one of the most visited sites online¹⁵¹ continues to develop its advertising platform, where some advertisers have reported a 4.5x return on ad spend,¹⁵² and moves into video with its December 2020 acquisition of TikTok rival Dubsmash. The site is included in our analysis of Advance Publications (owner of Condé Nast, majority shareholder in Reddit) in the table that follows.
- **Univision**, a media conglomerate specializing in broadcast, cable, digital, audio, and mobile media properties for Hispanic and Latino Americans sold its English language digital businesses to a private equity group at a loss, thus exiting the English-speaking media market. The digital portfolio included Gizmodo, Jezebel, Deadspin, Lifehacker, Kotaku, Jalopnik, Splinter, The Root, Earther, The Onion, and Fusion Digital, which were divested in 2019.¹⁵³

As there is a minimum size requirement in order to operate across platforms and genres, there is no ‘All Other’ in this category.



Table 5.1.3 Multi-Genre and Multi-Platform

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Sony Corp. of America ¹⁵⁴	\$20,790	30,888	10010
Disney ¹⁵⁵	\$9,100	12,500	91521
ViacomCBS ¹⁵⁶	\$8,970	7,677	10036
Hearst ¹⁵⁷	\$6,426	10,800	10019
IAC/InterActiveCorp ¹⁵⁸	\$3,070	5,665	10011
Discovery Inc. ¹⁵⁹	\$2,290	1,886	20910
Advance Publications ¹⁶⁰ (Condé Nast, Reddit)	\$1,750	12,950	10007
Univision ¹⁶¹	\$696	1,040	10011
Meredith ¹⁶²	\$450	1,743	50309
Tribune Media Company ¹⁶³ (acquired by Nexstar in 2019)	\$241	731	75062
Total	\$53,783	85,880	



Summary of Results in the Publishing Sectors

Over the four studies we have traced growth in categories whose names have changed but whose member firms have remained constant except for new entrants. Back in 2008 we called these firms large media companies. Then in 2012 we called them the online activities of traditional publishers and added digital publishers. In 2016 we called them news and information firms (these were relatively traditional) and the online activities of multi-genre, multi-platform firms. This year we kept those categories but separated out pure digital publishers from the more traditional news and information publishers.

Putting aside these name changes, we think it is illuminating to examine the growth of this mega-category over 12 years. It is summarized in the following table.

	2008	2012	2016	2020
Large media companies				
Revenue (\$M)	\$18,990			
Employment	46,545			
Traditional publishers online				
Revenue (\$M)		\$28,360		
Employment		45,676		
News and information				
Revenue (\$M)			\$18,198	\$22,898
Employment			47,777	42,410
Digital publishers				
Revenue (\$M)		\$1,160		\$8,675
Employment		13,624		13,891
Multi-genre, multi-platform firms				
Revenue (\$M)			\$19,603	\$53,783
Employment			34,391	85,880
TOTAL EMPLOYMENT	46,545	59,300	82,168	142,181
Employment growth over 4 years		27%	39%	73%



The table makes it clear that online publishing is dynamic. It is growing at an accelerating rate, both as traditional publishing firms go digital and as new pure digital firms enter. And the growth is much more from traditional firms adopting digital media than from born-on-the-internet firms out-maneuvering them. It may be that the future of publishing lies with firms from the mold of BuzzFeed and Red Ventures, but that is not how it looks today. Incumbent traditional firms across segments as different as Disney, News Corp., and The New York Times are adapting with dexterity.

5.1.4 Professional Services Guides

In this section we report on services that match consumers to businesses, generally supported by consumer-generated reviews and recommendations. While general search sites like Google are significant competition for matches and reviews, specialized matching firms have thrived in niche sectors such as household services and health and wellness. While in some ways they can resemble offline Yellow Pages and other long-familiar types of directories, because of their subjective content, some professionally generated, much of it user generated, they also bear similarities to forms of service journalism that thrived in print beginning in the 1960s.

The user-generated review site **Yelp**, now 12 years old, has U.S. operations located in San Francisco, Scottsdale, New York, and Chicago. In 2017 it announced its intention to exit most of its international business. Yelp has more than doubled revenues since our last report 2016. It is funded with paid listings. **CoStar Group**, a firm specializing in information and analytics for the residential and commercial real estate industries, appears in this section as its online marketplace division includes large sites such as Rent.com, Apartments.com, and CorporateHousing.com that match renters to agents and landlords. Another roll-up, this one supported by the private equity arm of KKR, is **Internet Brands**. It includes WebMD as well as guides to automotive, legal, home, and travel, and is advertising-supported. We estimate that 80% of its employment is in the U.S. based on a count of its offices. We also report on **OpenTable** here. Note that our analysis of crowdsourced travel review site TripAdvisor is not included here as it appears in our section on online travel and Angie (formerly Angie's List) and Home Advisor are covered in the entry of parent company IAC in the multi-genre and multi-platform section.

We make an allowance of 10% to capture the long tail of the many small online service guides in categories such as cleaning services, pet grooming, alternative medicine, wedding suppliers, and legal services. Brands include Thumbtack and Houzz in household services, Beautypedia in cosmetics, and Glassdoor in business services, as well as the Better Business Bureau and Manga.



Table 5.1.4 Professional Services Guides

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Yelp	\$1,000	6,000	94105
Costar Group ¹⁶⁴ (Rent.com, Apartments.com etc.)	\$625	2,151	20005
Internet Brands	\$560	1,360	90245
OpenTable	\$290	625	94104
All Other ¹⁶⁵	\$495	2,027	
Total	\$2,970	12,163	

5.1.5 Online Music and Audio

In our last report this section was simply labeled as ‘Online Music’ because at that time the big story was the maturation of the shift to streaming music, both subscription and advertising supported. In the intervening years we have seen the explosive growth of non-music audio, as podcasting has expanded to approximately 30 million episodes and close to 1 million active podcasts that reach over 100 million Americans each month.¹⁶⁶ As is so often the case with industries with a low barrier to entry, podcasting is a very long tail business, in which 1,000 downloads places the show in the 20% of all podcasts, 30,000 downloads places the show in the top 1% of all podcasts, and the median number of downloads is 123.¹⁶⁷

Revenue for the podcasting sector is now approaching \$1 billion annually,¹⁶⁸ a more than fivefold increase from our last report of four years ago. This revenue figure refers to advertising-supported, free content. We also note a shift to premium content by a few key providers such as Apple¹⁶⁹ and Spotify,¹⁷⁰ a move that has been referred to by some as a Netflix for podcasts approach.



There are several driving forces behind this shift to non-music audio, among them the continuing search for a viable business model in the streaming music sector. Using the largest streaming service, **Spotify**, as an example, note that while the company's global revenues approached \$10 billion in 2020, their net losses continue to increase, reaching \$706 million last year.¹⁷¹ This is due primarily to approximately two thirds of revenues for music streaming being paid to rights holders, not artists, or the platform itself. Non-music audio offers platforms a chance to monetize without having to pay revenue to third-party rights holders.

In parallel to these challenges, and as a response to them, we are witnessing the rise of creator-first, artist-centric platforms where musicians, DJs, and podcasters can monetize with fans using the platforms, through premium subscription revenue, or through ad-supported versions of the app. In this category are sites such as **SoundCloud** (20 million creators and 300 million users)¹⁷² and Mixcloud (1 million creators and 20 million users).¹⁷³ Another hurdle recently cleared in the streaming music space is the apportioning of royalties based on dividing a single bucket of revenue rather than applying the advertising or subscription revenue to the artists each person listened to. To address the inequities of this single bucket payment system, SoundCloud recently announced an industry-first move in which "each listener's subscription or advertising revenue is distributed among the artists that they listen to, rather than their plays being pooled – benefiting rising independent artists with loyal fans."¹⁷⁴

Another highlight in this sector is that legacy audio and digital-first platforms have continued to build out digital audio infrastructure including content, measurement, analytics, and advertising technology acquisitions in the four years that have elapsed since our last report. For example:

- **Spotify** acquisitions: Sonalytic, Mediachain, Niland, Soundtrap, Loudr, Gimlet, Parcast, Anchor, The Ringer, SoundBetter, Megaphone, Locker Room
- **Sirius XM** acquisitions: Pandora, Midroll, Simplecast, Stitcher
- **Entercom** acquisitions: Radio.com, Pineapple Street Media, Cadence 13
- **iHeart Media** acquisitions: Triton, Voxnest, Stuff Media

Note that the audio activities of firms such as Apple, Amazon, and Alphabet are reflected in the analyses of these companies in the 'Integrated Firms' section of the report. We have not created an 'All Other' section for this sector because music streaming sites need to be of a certain size to have licensing deals with music labels.



Table 5.1.5 Online Music and Audio

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Spotify ¹⁷⁵	\$1,910	2,021	10007
Sirius XM/Pandora ¹⁷⁶	\$1,530	1,870	10104
iHeart Media (formerly Clear Channel) ¹⁷⁷	\$409	880	78258
Entercom/Radio.com ¹⁷⁸	\$218	470	19103
Tidal ¹⁷⁹	\$101	107	10001
SoundCloud ¹⁸⁰	\$50	379	10003
TuneIn ¹⁸¹	\$37	200	94107
Total	\$4,255	6,520	

5.1.6 Games

The gaming industry is one that has been growing at a frenzied pace, and across a variety of devices, platforms, and business models. In 2020, the industry was more valuable than Hollywood and North American sports combined, with a good portion of this growth attributed to consumer habits during the COVID-19 lockdown.¹⁸² On average gamers spent over seven hours per week playing games in 2020, with almost one third exceeding that amount.¹⁸³

Since the time of our last report four years ago we have seen major innovations in gameplay and business models gaining traction with both game enthusiasts and developers:

- **Free to play (F2P)** (e.g., Fortnite and Apex Legends) where revenues are realized from the purchase of in-game items that include tools, weapons, and even outfits that augment characters and add another layer of customization to each person’s gameplay.
- **Subscription cloud services** such as Liquid Sky, Gaiikai, GeForce Now.



- **Third-party distribution platforms** such as Steam and indie game platform itch.io¹⁸⁴ and massive game creator platforms such as Roblox, on which hundreds of thousands game developers generate revenue, often on more favorable terms than those offered by the major online distributors.
- **The emergence of a metaverse** the coming together of the internet, virtual reality, and augmented reality. Virtual DJ sets and concerts by rappers Travis Scott and Lil Nas X that were staged in Fortnite and Roblox attracted tens of millions of players and are among the most high-profile examples of the game industry metaverse.

In this section we have analyzed the largest of the video game companies and platforms. Note that the substantial game-related activities of Microsoft, Google, and Amazon are accounted for in section of this report on integrated firms and that Sony is accounted for in the section on multi-genre and multi-platform publishers.

Among the firms analyzed separately were large legacy players and new companies that have risen to dominance over the past four years.

These firms include:

- Valve Software, which first rose to popularity at the end of the 1990s as the company behind games such as Counter Strike and Team Fortress. Now it's best known for Steam, which has become the world's biggest distribution platform for PC games. Steam hosts tens of thousands of games¹⁸⁵ and logged 120 million monthly users in 2020.¹⁸⁶
- Epic Games, publisher of the enormously popular Fortnite, a F2P game with more than 350 million users. In April 2020, revenue for Fortnite alone was \$400 million.¹⁸⁷ The company also produces the Unreal Engine, license-free software used to build games, and more recently in virtual production for film and TV.
- Activision Blizzard, the company behind the massive game franchises World of Warcraft and Call of Duty, has also developed a highly diversified revenue mall that includes premium, F2P, subscription, and advertising-supported games.

The rationale used for our estimates in the table below is as follows: First, we performed an individual level analysis of the largest firms in the industry. We then noted that we account for the large tech firms with gaming subsidiaries in the 'Integrated Firms' section of the report, or the multi-genre and multi-platform section of the report (e.g., Amazon, Microsoft, Google, Disney, and Sony). We estimate \$12 billion of U.S. internet-dependent gaming revenue from these firms, but don't include this number in our calculation as these revenues are accounted for in their respective sections of the report. We then consulted the membership of the Entertainment Software Association (ESA)¹⁸⁸ where we noted 40 companies are listed as members. We went on to conduct a revenue review of a sampling of the industry



members on the list and determined that many had revenues under \$100 million and therefore should be accounted for in our ‘All Other’ category. By this reasoning we estimate the internet-dependent U.S. revenue for the ‘All Other’ section is \$10 billion.

Table 5.1.6 Games

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Activision Blizzard ¹⁸⁹	\$3,170	3,598	90405
Valve Software (Steam) ^{190 191}	\$3,080	918	98004
Epic Games (Fortnite) ¹⁹²	\$2,500	451	27518
Electronic Arts ¹⁹³	\$1,600	2,964	94065
Take-Two Interactive ¹⁹⁴	\$1,371	2,061	10036
Zynga ¹⁹⁵	\$1,200	1,364	94103
Ubisoft ¹⁹⁶	\$729	349	94107
Nintendo ¹⁹⁷	\$600	955	98052
Roblox ¹⁹⁸	\$565	720	94403
All Other	\$10,000	9,032	

5.1.7 Online Video

Streaming video content, known in the industry as over-the-top television (OTT) has grown rapidly in recent years. Consumers spent close to 1 trillion hours on streaming video apps in 2020¹⁹⁹ and global streaming subscriptions exceeded 1 billion for the first time.²⁰⁰ In parallel with the enthusiastic consumer uptake of Netflix, Amazon Prime Video, Hulu, and others, there has developed a competitive market free advertising-supported streaming TVs (FASTs), which offer viewers an assortment of catalog TV and movie content without subscription or commitment. These new streamers, including Fox’s Tubi, Viacom’s Pluto, and Univision’s Vix and Prende digital media brands, are accounted for in the multi-genre and multi-platform section earlier in this report. Note that in this section we cover only those services not covered elsewhere, but do mention the online video services of Amazon, Alphabet, and Facebook for descriptive purposes.



There is brisk competition in online video coming from what would have previously been considered the sidelines. In previous studies YouTube was the online upstart living in these sidelines. Now YouTube is the world's largest video streaming platform with two billion global users, over one billion hours of content viewed every day, and an estimated \$20 billion in revenue for 2020.^{201 202} On YouTube's heels we note apps such as TikTok, Triller, Snapchat and Instagram, in genres as plentiful as creators' imaginations contributing to a happy addiction to short, scroll-through video clips for billions of users around the world. Note that video-based, social apps such as TikTok and Snapchat are accounted for in the section on social media sites.

There are also the big changes afoot at Twitch, previously focused exclusively on game-related content, but now also home to DJs, comedians, talk shows, musicians, and a variety of artists streaming live content that accounted for 1 trillion minutes watched in 2020, a 69% year-over-year increase for the platform.²⁰³ While Twitch is owned by Amazon, Instagram by Facebook, and YouTube by Google/Alphabet—companies whose revenues and employment numbers are accounted for in the 'Integrated Firms' section of this report—we include an overview of those companies' activities here as well as references to some of the social media video sites as well as the activities of streaming subsidiaries of firms such as Disney and NBC for the purposes of providing a meaningful snapshot of the online video landscape.

Other highlights in the online video sector:

- As the streaming giants compete for subscriptions and global viewers, billions are being invested in content development, providing a raft of new buyers for TV and film producers. In 2020 Netflix spent \$16 billion on content, Amazon Prime Video spent \$7 billion, Apple TV+ spent \$6 billion, Hulu spent \$3 billion, Disney+ spent \$1.75 billion, HBO Max spent \$1.5 billion, and Peacock (NBCUniversal) spent \$1 billion.²⁰⁴
- Vimeo shifts its focus to live events, tools for enterprise creators, and third-party integrations. Long owned by IAC, which appears in the multi-genre and multi-platform section of this report, Vimeo is about to become a standalone company.²⁰⁵
- Vevo, owned by three of the major labels (Universal, Sony, and EMI) and originally established to license videos for use online with YouTube being its biggest distribution channel, shuttered its consumer-facing service in 2018 and changed its focus to syndicating its content across platforms (e.g., YouTube, Apple TV+) and distribution partners (e.g., Roku, Samsung, Vizio),²⁰⁶ and direct-to-consumer streaming video offerings such as Peacock (NBCUniversal), AMC Networks (Sundance, IFC, BBC America, etc.) Showtime (CBS Corporation), Starz, and HBO (Warner Media).

Apart from AMC Networks and Starz, the above noted firms offering direct-to-consumer streaming video have parent companies accounted for elsewhere in the report. We therefore only individually analyze AMC Networks and Starz from this list of firms. Our estimates for **AMC Networks'** direct-to-consumer



streaming revenue appears in the table below and is based on our analysis of both the company’s financials and an analyst’s report that states that streaming represents a 6% share of the company’s overall revenues.²⁰⁷ In the case of **Starz**, the filings of parent company Lions Gate Entertainment Corporation indicate that the company’s direct-to-consumer video service is part of its media networks segment, reporting revenues alongside motion picture and television production. Our estimate for the domestic streaming and revenue in the table below is based on figures reported in the 2020 10-K filing and percentages of streaming to legacy media revenues in an analyst’s report.²⁰⁸

Not surprisingly, the largest firm in this section is **Netflix**. In 2020 it grew to 203 million global subscribers, of which on third, or 67 million, were in the U.S., representing \$10.35 billion in revenue.²⁰⁹ These figures represent substantial growth for Netflix since our last report, at which time the streaming service had 48 million subscribers in the US and approximately \$3 billion in U.S. revenues. But the bigger growth story for Netflix is in its international markets. Between Q4 2019 and Q4 2020, for example, Netflix added 6.2 million subscribers in North America, while it grew by over 30 million subscribers in international markets.²¹⁰

Despite Netflix’s ongoing growth globally it’s also important to note the effects of fragmentation in the streaming market; at the time of our 2016 report Netflix represented 35% of global internet traffic, while in 2020 it represented just 11%.²¹¹

Table 5.1.7 Online Video

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Netflix ²¹²	\$10,350	4,700	95032
Starz ²¹³	\$686	252	90404
AMC Networks ²¹⁴	\$126	135	10001
Total	\$11,162	5,078	



Summary of Results in the Online Entertainment Sectors

Consolidating the last three sectors across our four reports we find that in 2008 these sectors played no material role in the internet ecosystem. YouTube was only three years old, audio ran on proprietary systems within, for example, AOL, and games were distributed in boxes. The sectors began to appear in our 2012 report, and grew at an accelerating rate in the last eight years as the following table shows:

	2012		2016		2020	
	Revenue (\$ billions)	Employment	Revenue (\$ billions)	Employment	Revenue (\$ billions)	Employment
Entertainment sectors						
Music and audio	\$142	1,153	\$2,558	3,163	4,255	6,520
Video	\$368	1,043	\$6,345	4,706	\$11,162	5,078
Games	\$2,974	7,037	\$3,673	8,683	\$24,815	34,010
Total	\$3,484	9,233	\$12,576	16,552	\$40,232	34,010
Growth	-	-	261%	79%	220%	105%

The table illustrates that entertainment is a sector of the internet ecosystem where revenue has grown far more rapidly than the internet ecosystem as a whole in the past eight years. Gaming has long been a large factor in internet entertainment, and now streamed audio and video are joining it.



5.1.8 Online Learning

The current booming market in online learning technologies was certainly hastened by COVID-19, but the underlying technologies have been around for years. During those years we witnessed the growth of conventional learning organizations with existing relationships in the educational and corporate training markets branching out into online offerings of accredited courses and learning resources for universities and K-12 education, and professional credentials and skills upgrading for such sectors such as healthcare and IT.

And then 2020 and 2021 happened, with remote communication and learning transformed into features of our everyday lives. While the legacy providers in this sector continue to account for the highest revenues and employment numbers in online learning, both users and investors have recently shown a new exuberance for remote learning options, whether for work or leisure purposes.

But the most widely used software for online learning in the past year and half has been Zoom. Although it wasn't initially developed as an educational tool—it was launched as a competitor to enterprise communications tools such as Webex (Cisco), BlueJeans (Verizon), Adobe Connect, and Microsoft Teams—Zoom ended up being the de facto standard for online instruction, workshops, and conferences by hundreds of millions around the world during the pandemic. The competitor products mentioned here are accounted for in the section of this report that deals with their parent companies.

Zoom is a freemium product, with a free to use service with basic features, and a pro version that allows for unlimited time and larger groupings of participants. For the twelve months ending January 31, 2021, Zoom's global revenue was \$2.65 billion, up markedly from just \$623 million and \$330 million in the two previous years respectively. \$1.46 billion of this amount was U.S. revenue, and company employment in the U.S. was 2,622. Recent acquisitions by Zoom include end-to-end encryption identity linking firm Keybase and cloud contact center Five9. The abrupt shift to online learning in 2020 also saw startups that were either footnotes or not mentioned in our 2016 study (e.g., Udacity, Udemy, Coursera, Course Hero) grow to nine figure revenues (\$100 million+) and valuations exceeding \$1 billion each. These platforms and the startups following in their footsteps offer millions of courses and learning resources to students of all ages as well as the tools with which anyone can create and monetize a course online.



We also note the ascendance of what’s been called “the app that helped bored people get through lockdown.”²¹⁵ Where Berlitz and Rosetta Stone once ruled language learning, with pay per course or subscription models, Duolingo now does, and with a specifically digital business model that builds on existing ones such as ad-supported and freemium. In Duolingo’s case it’s crowdsourcing that enables over 300 million global users to study 38 different languages through its app, website, and podcast. The innovation here is the use of a gamified approach, with questions, answers, and image identification responded to by users that serve the double duty of teaching a language to users and acting as a translation service for companies such as CNN and BuzzFeed.²¹⁶ Duolingo also offers a premium version of its service, with offline capability, progress quizzes, and an ad-free experience. 4% of users currently pay for Duolingo Plus and that 4% represents 80 to 85% of the company’s revenues according to The Wall Street Journal.²¹⁷ 2020 global revenues are estimated at \$200 million, a massive increase from the approximately \$1 million at the time of our study in 2016.²¹⁸

Other highlights:

- The emergence and uptake of online learning marketplaces, often referred to as the YouTube or Netflix of learning. Examples include Kajabi and Skillshare,²¹⁹ platforms that provide a one stop solution for creating, distributing, and monetizing online courses. Both are growing quickly but have less than \$100 million in annual revenues and are therefore accounted for in our ‘All Other’ category.
- The lack of success of non-profit online learning programs by universities. In 2012 Harvard University and MIT embarked on edEx, a public online learning initiative to stave off for-profit enterprises launched by Stanford computer scientists, Udacity and Coursera.²²⁰ It appears that the profit-motive forces have won, and the assets of edEx have been sold to 2U, a for-profit online course manager included in the ‘All Other’ section of the table below.
- The appearance of pay-per-use learning marketplaces such as TeachersPayTeachers.com, where over five million teachers purchased over one billion digital education resources in 2020, and the on-demand tutoring by live chat offered by NerdyTutors.com
- Up and coming companies in this sector include MasterClass, TakeLessons, Codecademy, and Datacamp. They are accounted for in our ‘All Other’ category.

We also note that companies that provide online learning for the IT sector, though it is not their core business, such as Citrix and Oracle, are accounted for in the sections of this report where those firms are covered.

The table below provides our individual analyses of the major online learning providers and their U.S.-based revenue and employment. We allow an additional \$914 million in revenue and a further 3,970 employees to account for the long tail in this sector.



Table 5.1.8 Online Learning

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Apollo Education Group ²²¹	\$2,100	7,500	85040
Zoom ²²²	\$1,460	2,662	95113
Follett ²²³	\$957	3,333	60154
Strategic Education Inc. ²²⁴	\$905	2,490	20171
Grand Canyon ²²⁵	\$633	3,469	85017
Varsity Tutors ²²⁶	\$547	3,777	63105
Scholastic ²²⁷	\$508	3,000	10012
Perdoceo Education Corp. ²²⁸	\$453	3,102	60173
APEI ²²⁹ (American Public Education Inc.)	\$280	2,377	25414
HealthStream ²³⁰	\$254	1,053	37203
Udemy ^{231 232}	\$200	1,982	94107
Skillsoft ^{233 234}	\$198	1,150	03062
Coursera ^{235 236}	\$144	1,624	94041
Renaissance Learning ²³⁷	\$119	893	54494
Outschool ²³⁸	\$108	748	94107
Duolingo ²³⁹	\$100	191	15206
Course Hero ²⁴⁰	\$100	200	94063
Udacity ²⁴¹	\$75	150	94040
All Other ²⁴²	\$914	3,970	
Total	\$10,055	43,671	



5.2 Retailing

5.2.1 Ecommerce

Ecommerce is now a \$4 trillion business globally, of which \$538 billion is in U.S. sales in 2020.²⁴³ At its inception in the mid-1990s it grew slowly. It was 5% of U.S. retail sales revenue in 2012, and in 2018 it was 10%. Now, following the pandemic quarantine, ecommerce’s share is over 21%.²⁴⁴ This acceleration will likely abate when consumers can return to stores.

This section of the report estimates the contribution of ecommerce to the internet in three groups: individual figures for the top 10, an aggregate figure for the revenues of internet retailers ranked 11 through 500, and an aggregate figure for those smaller than the top 500. To do so we rely heavily on the 2020 report of Digital Commerce 360 and guidance from the same researcher that the global revenues of the top 10 are \$585 billion and the global revenues of the next 11 to 500 are \$316 billion. Because these totals are global, we need to estimate U.S. revenues from SEC filings for the firms that Digital Commerce 360 identifies as the top 10. We rely also on the U.S. Census Bureau for total U.S. retail ecommerce sales, using it to get revenues of firms smaller than the top 500 by difference.

The paragraphs that follow lay out our method of calculating eCommerce revenue and employment. The argument is dense, so here are the headline conclusions:

- There are 2.1 million ecommerce firms operating in the U.S.²⁴⁵ which generated \$715 billion in revenues in 2020.
- Amazon is the largest ecommerce firm, with U.S. ecommerce revenues of \$213 billion in 2020.
- The top 10 U.S. ecommerce firms generated \$331 billion in revenue, which is 46% of total 2020 U.S. ecommerce revenues.
- The next 500 ecommerce firms accounted for \$300 billion revenues, or 42% of total revenues.

The top 10 retailers according to Digital Commerce 360 are shown in Table 5.2.1. **Amazon’s** U.S. revenue is taken from its SEC filings. We report the detail in the ‘Integrated Firms’ section, but it is included in this table to check our estimate of U.S. revenues against Digital Commerce 360’s estimate of global revenues. This is also the case also for **Dell** and **Alphabet**. **Walmart’s** U.S. ecommerce revenue in the most recent four quarters is estimated at \$34 billion,²⁴⁶ about 80% of the global ecommerce revenue reported in SEC filings. Absent reporting on online employment, we use an average of similar companies’ employment to support eCommerce. **Dell** does not report online sales separate from all retail sales. We ascribe 50% of online revenue and employment to retailing.

Apple’s 10-K does not break out online/mobile/app sales, but an industry source estimates 15-20% of its sales are online.²⁴⁷ The U.S. segment is reported as part of The Americas, of which we assume 75% of revenues are in the U.S., and then use a ratio of 17.5% (midway between the 15% to 20% estimate



referenced above) to estimate U.S. online sales. For the employment estimate we take 147,000 global employees reported in the 10-K and apply our formula for computing the portion attributable to the U.S. and online to arrive at the figure in the table below.

Because The **Home Depot** does not report online sales, our estimate is benchmarked against percentages for online sales reported for competitor Lowe's,²⁴⁸ which is 8%, therefore \$9.76 billion is U.S. online revenue. For our employment estimate we take the reported figure of 451,500 U.S. workers and assume, as per competitors, that 60% are full time and assume that the number servicing the online business is in the proportion of online sales to total sales. **Wayfair's** public filings indicate that substantially all revenues are ecommerce, and the U.S. segment is 84% of global revenues. We therefore attribute \$11.8 billion to U.S. online sales and use the same proportion to calculate U.S. internet-dependent employment in the table below.

Alphabet is analyzed in the 'Integrated Firms' section. Most of the revenue reported there is for services. Here we make an allowance for the products that it sells, such as Nest, Fitbit, Chromecast, Pixel Phones, and Hubs, and apply Apple's employment per unit of online revenue. We apply the midpoint of Digital Commerce 360's global revenue estimate reduced by 30% for U.S. revenue and an average for employment per revenue dollar taken from comparable companies.

Staples is no longer a public company, so we take 80% of Digital Commerce 360's estimate of global revenue to estimate its U.S. revenue. **Qurate** (formerly Liberty Interactive) owns QVC and HSN, whose U.S. operations are reported as QXH, online retailer Zulily, and five apparel and home product brands known as Cornerstone Brands. All Zulily's reported revenue of \$1.6 billion is taken as U.S. internet revenue, but much of QXH is video commerce. The company reports 56% of global revenue as ecommerce, so we apply this ratio to QXH. We assign a fraction of global employment of 22,200 in the proportion of online to all revenue. For **BestBuy**, online sales are not reported separate from all retail in SEC filings. We therefore use the midpoint of the 15% to 20% range for online to offline sales reported by an industry source,²⁴⁹ to arrive at our U.S. internet-dependent revenue figure. We then apply the same ratio to 90% of reported North American full-time employees as U.S. internet-dependent employment.

The total U.S. revenue for the top 10 is 60% of the global figure. Some of the remaining 490 companies are large, for example Etsy, Target, Kroger, Macy's, and Costco, but sizes fall away rapidly. The smaller companies are not global, so it is reasonable to assume that 95% of Digital Commerce 360's total for companies 11 to 500, which is \$299,800, are U.S. revenues. We obtain revenues for firms smaller than the top 500 by subtraction from the Department of Census total for 2020 U.S. ecommerce revenue of \$759,470.²⁵⁰ We then estimate employment by applying the ratio of employment to sales for seven of the ten individually analyzed firms (excluding Amazon, Apple, and Google) to the two groups of companies.



Table 5.2.1 Ecommerce

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Amazon (reported in the 'Integrated Firms' section therefore in grey)	\$212,700	568,500	98109
Walmart ²⁵¹	\$34,000	59,000	72712
Dell (reported in 'Infrastructure' section therefore in grey)	\$20,730	30,500	78632
Apple (reported in the 'Integrated Firms' section therefore in grey) ²⁵²	\$16,350	8,757	95017
Wayfair ²⁵³	\$11,800	13,542	02116
HomeDepot ²⁵⁴	\$9,760	18,900	30339
Best Buy	\$7,600	54,000	55423
Qurate (formerly Liberty Interactive)	\$6,416	10,042	80112
Staples	\$6,000	10,000	01702
Alphabet (reported in Infrastructure section therefore in grey)	\$5,250	3,750	94043
Internet Retailers 11 - 500	\$299,800	545,216	
All Other Internet Retailers	\$105,472	191,684	
Total (excluding Amazon, Dell, Apple, and Alphabet, reported elsewhere)	\$480,848	902,384	

An emerging and rapidly growing segment of ecommerce is direct-to-consumer (DTC) retailing. We examined a list of the top 250 DTC companies provided by the IAB.²⁵⁵ Employment and revenue are reported in categories, not in precise numbers, but it is apparent that the largest DTC product brands, Chewy, Stitch Fix, Home Chef, Peloton, Away, The Honest Company, and ThirdLove, are significant ecommerce employers. Stitch Fix ranks at number 40 on the Digital Commerce 360 list, and Peloton ranks 121. There is a long tail of DTC product brands, however, and U.S. DTC product employment by the 250 leaders is, as of 2020, about 4% of all ecommerce employment.



5.2.2 Ecommerce Sellers

The previous section, 5.2.1, estimated the jobs needed to run the platforms. This section estimates the jobs of those who sell on the platforms. Individual sellers and small companies use the platforms, such as Amazon, eBay, and Etsy, to reach customers, and the revenue they generate net of cost of goods. As the average seller earns less than the national average wage, we adjust the number of sellers to the Social Security Administration's full-time equivalent.

Amazon sellers: Marketplace Pulse estimates that Amazon's Marketplace accounted for \$300 billion of gross merchandise value (GMV) globally in its most recent year.²⁵⁶ Data on number of Amazon sellers joining in the past year and past three years²⁵⁷ finds that one third of them are in the U.S. and we assume that ratio applies to all Marketplace sales. Thus, U.S. Marketplace GMV is \$100 billion. Independent research suggests that sellers earn about 20% of gross revenue after paying for the goods, so that Marketplace annual revenue is \$20 billion.²⁵⁸ A sample of Marketplace sellers on Amazon from an index of sellers²⁵⁹ produces revenue of \$200,000 per seller firm, from which we conclude that Marketplace provides employment for about 100,000 people working as individuals and in companies.

eBay sellers: We follow a process like that in the previous section to estimate how much employment is created by people selling on eBay. Although eBay reports that 80% of items sold on eBay are new, often by established offline manufacturers, and the remaining 20% are old,²⁶⁰ sales on the eBay platform whether new or old create internet-dependent employment. The company reports that GMV in 2020 was \$100 billion, and U.S. revenue was 40% of global revenue. U.S. sellers' gross revenue is \$40 billion, which, net of the cost of these goods is \$8 billion. A sampling from the website Webretailer.com suggests to us that eBay sellers generate about \$133,000 per employee, suggesting that 60,000 people are employed in eBay seller companies and as individual sellers.

Etsy sellers: In 2020 growth surged on Etsy, the platform for handmade, unique, and vintage items. At the end of 2019 Etsy had 2.5 million sellers and by the end of 2020 the number of sellers had risen to 4.3 million. A similar dramatic increase was seen in the number of buyers. At the end of 2019 there were 46 million Etsy buyers; a year later there were 82 million. The U.S. represents 62% of all Etsy sellers, and 97% of Etsy sellers operate from their homes.²⁶¹ Etsy reports in SEC filings that the GMV of sales is \$10.3 billion, or \$6.4 billion in the U.S. Because a high proportion of items sold are self-made, we assume that the annual revenue of U.S. sellers is 50% of GMV, or \$3.2 billion. We take median income per seller to be \$6,200 per year after fees,²⁶² so we conclude that there are 516,000 sellers, almost all individuals earning a fraction of mean full-time equivalent wages, so we convert to 58,200 full-time equivalent sellers.

Craigslist sellers: Craigslist's revenue has dropped from a peak of \$1 billion in revenue in 2018 to \$600 million this year due to competition from Facebook marketplace and local buying and selling sites such as NextDoor and OfferUp.²⁶³ It is difficult to infer GMV from revenue for Craigslist because all postings are free except for job postings, some apartment rental and commercial real estate ads, and dealer sales in selective categories. Craigslist also earns revenue from services, but services do not contribute to GMV.



As an estimate, we assume that GMV sold on Craigslist is twice as great per dollar of platform revenue as on eBay. On eBay GMV is 10 times platform revenue. Craigslist makes most (we assume 80%) of its revenue from the U.S. markets, so U.S. GMV is assumed to be 80% of 10 times Craigslist’s platform revenue of \$600 million, or \$4.8 billion. We assume each seller makes \$25,000 per year, so the number of sellers is estimated at 48,000.

Sellers enabled by Shopify: Websites using Shopify software do not report their merchant GMV, but Shopify does report that its platform revenue is earned 50% in the U.S. Using an estimate from a third-party source²⁶⁴ and using the assumptions made for Amazon to move from GMV to number of sellers would yield 60,000 merchants. However, another third-party source estimates Shopify’s U.S. market share at 22% of Amazon’s²⁶⁵ which would suggest about 22,000 merchant employees. We take the midpoint of these two estimates.

We allow 10% for ‘All Other’ sellers to account for small, specialized seller platforms, and an allowance for people who use ecommerce software such as WooCommerce, Magento and BigCommerce without relying on a platform to match to buyers. For example, a suburban garden club adopted the WooCommerce payment and inventory display features to move its annual sale of shrubs to local residents from in-person to online.

Table 5.2.2 Ecommerce Sellers

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Amazon sellers	\$20,000	100,000	Dispersed across the U.S.
eBay sellers	\$8,000	60,000	Dispersed across the U.S.
Etsy sellers	\$3,200	58,000	Dispersed across the U.S.
Craigslist sellers	\$4,800	48,000	Dispersed across the U.S.
Shopify sellers	\$4,400	40,000	Dispersed across the U.S.
All Other	\$8,600	25,610	
Total	\$49,000	331,610	



5.2.3 Online Travel Services

The ability to comparison price shop, sign up for fare alerts and destination package price drops, and book online directly with airlines and accommodations providers has transformed the travel industry into one that has become increasingly competitive and consumer centric. This segment of our report examines the companies that provide internet-dependent travel services in the U.S., putting tools in the hands of consumers that allow self-service researching and booking of travel as well as the capture and aggregation of the ‘voice of the customer’ in the form of ratings and reviews made available on websites and apps.

Our analysis includes digital first online travel agencies (OTAs) such as **Expedia** and **Booking.com** as well as the online presences of legacy travel agencies and direct booking on airlines’ own sites and apps. The latter have become a growing source of industry revenue that allows airline and hotel operators to avoid the commissions of 5% to 25% or higher charged by the OTAs.²⁶⁶ Recent industry data estimates that 49% of online hotel and lodging gross bookings in the U.S. are now done directly, spurred by loyalty program perks and direct booking discounts.²⁶⁷ In the airline industry it is estimated that 60% of revenue comes directly from passengers.²⁶⁸

Since our last report in 2016 we note further consolidation in the digital-first OTA sector with the largest, Expedia and Booking, continuing to expand and acquire newer market entrants. Both companies are close to 25 years old and have become top global providers in the travel industry. With its aggregation of 880,000 hotels, over two million non-hotel accommodation products, and over 500 airlines, **Expedia’s** family of brands include **Orbitz**, **Hotwire**, **Hotels.com**, **Travelocity**, and **Trivago**. **Booking Holdings Inc.**, formerly Priceline Group, is the second largest in this segment in the U.S., with its brands that include **Booking.com**, **Kayak**, **CheapFlights**, **Agoda**, **OpenTable**, and **Rentalcars.com**.²⁶⁹ Together Expedia and Booking are said to represent 90% of the revenues in the OTA market in the US.²⁷⁰

While Expedia and Booking and its sub-brands are top of mind for most consumers in the online travel space, the sector possesses a long tail of over 400 OTAs operating globally.²⁷¹ Familiar names include Travelzoo and CheapoAir and its parent company Fareportal. We account for the long tail of the OTAs in the ‘All Other’ category in the table below. And though to consumers **TripAdvisor** is thought of as a review site, we include it in this section as the bulk of its revenues come from click-based advertising which directs users to the sites of hotels, airlines, cruise companies, and assorted OTAs.²⁷² We also note the emergence of new long-tail online marketplaces focused on niche services in travel such as Glamping Hub, RV Share, and Tentrr, though most currently have revenues in the low single digit millions.²⁷³ These firms are accounted for in the ‘All Other’ section of our analysis of platform-based services.

To calculate the revenue derived from non-OTA direct booking of travel through airlines’ websites and apps we consulted the annual reports of the top four U.S. airlines (American, Southwest, Delta, and United) that account for 65% of the U.S. air travel market and then extrapolated the total revenues of



U.S. air travel in 2020.²⁷⁴ In so doing, we deducted non-passenger revenues such as cargo fees from the numbers reported and noted the percentage of bookings attributed to direct digital channels that were reported. Based on both industry sources and the annual reports we reviewed, the industry standard for direct bookings in 2020 is approximately 60%, with Southwest Airlines as the outlier with 83% of fares booked directly through the app or website. As the low-cost carrier stated in its most recent annual filing: "...[the] direct to customer distribution approach has historically provided a cost advantage for the Company because it eliminates fees associated with the use of third-party distribution channels such as third-party online travel platforms."²⁷⁵ Using this method our estimate for U.S. passenger revenue in 2020 was \$255 billion, of which \$153 billion²⁷⁶ came from the top four U.S. airlines noted above. We use the industry standard of 60% and apply it to the revenues of American, Delta, and United, and use 83% to calculate the revenue from direct bookings for Southwest. Our estimate for direct booking revenues for the top four airlines is \$31.4 billion and we add \$61 billion for the remainder of the industry (e.g., Alaska, JetBlue Spirit, Frontier, and SkyWest) for a total of \$92.4 billion. Our estimate of employment assumes that 10% of American Airlines' 133,000 employees work in information technology, and 25% of those workers are associated with maintaining reservation apps and back-office booking systems. We apply American Airlines' market share of 15% to generate the industry-wide internet employment of 22,200.

Our estimate for revenue from non-OTA direct booking for hotels is based on industry reports of \$108 billion in U.S. revenue in 2020²⁷⁷ of which 49% take place through direct channels.²⁷⁸ Therefore \$52.9 billion in room revenue may be attributed to the use of direct digital booking channels. For employment we applied the same productivity rate as for airlines.

Table 5.2.3 Online Travel Services

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Expedia ²⁷⁹	\$2,900	10,696	98119
Booking Holdings LLC ²⁸⁰	\$783	3,400	06854
TripAdvisor ²⁸¹	\$302	1,038	02494
Direct booking via hotels' own sites and apps	\$52,900	12,710	
Direct booking via airlines' own sites and apps	\$92,400	22,200	
All Other OTAs ²⁸²	\$368	1,410	
Total	\$149,653	51,454	



5.2.4 Online Ticketing

For event companies and concert promoters, online is the dominant sales channel. This is the case for both primary markets (purchase of tickets from the organizers) and for secondary markets (the resale of tickets among consumers).

Live event revenues declined very substantially during the COVID-19 quarantine. The largest company analyzed in this section is **Ticketmaster**, a subsidiary of Live Nation Entertainment. In its SEC filings Live Nation reports a ticketing segment revenue decline of 84%, with just \$188 million in ticket sales in 2020 compared to \$1.54 billion in 2019. The filing also reports that online sales (web and mobile apps) account for 95% of revenues, with the remaining 5% split between sales at physical outlets and telephone call centers. We therefore assume 95% of reported ticket sales took place online and 50% of online sales were in the U.S., so we report \$89 million in the table below.

The calculation of Ticketmaster’s internet-related employment in 2020 is complicated by COVID-19 furloughs and part-time hiring for periods of peak demand. Live Nation’s 10-K reports, “As of December 31, 2020, we had approximately 8,200 full-time employees, including those on furlough due to the interruption in our business from the pandemic. During regular operational times, our staffing needs vary significantly throughout the year. Therefore, we also employ seasonal and part-time employees, primarily for our live music venues and festivals. At the end of 2019, prior to the pandemic, we employed approximately 15,400 seasonal and part-time employees and during peak seasonal periods, particularly in the summer months, we employed as many as 28,000 seasonal and part-time employees in 2019.” Even if no seasonal employment is assumed during the quarantine, 8,200 employees cannot be sustained by revenues of \$188 million. We assume \$100,000 per employee and estimate the economically justifiable employment at full-time rates of pay for 2020 to be 90.

Next, we analyze **Eventbrite**, which bills itself as “a self-service platform to make it possible for anyone to create and sell tickets to live experiences.” We note that Eventbrite acquired ticketing company Ticketfly in 2017. As many of Eventbrite’s events took place virtually during COVID-19, the company’s decline in revenue, while substantial, was nowhere near the level of Ticketmaster’s. Eventbrite’s SEC filings report \$106 million in global revenue for 2020, down from \$327 million in 2019. The U.S. portion of 2020 revenues is reported as \$73 million and U.S. employment as 352. Even this modest employment seems large, so we assume 73 people at full-time wages.

Secondary market ticket seller Stubhub is a subsidiary of eBay, so is not reported in this section to avoid double counting. Our ‘All Other’ category for this section includes ticket reseller companies such as Seatgeek, VividSeats, and TickPick. In non-pandemic times such smaller firms have reported global revenues close to \$100 million, but experienced dramatic declines in the past year due to the closing down of most concert and sporting events. ‘All Other’ sales are therefore taken to be \$100 million and employment of 100.



Table 5.2.4 Online Ticketing

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Ticketmaster²⁸³	\$89	90	90210
Eventbrite²⁸⁴	\$73	73	94103
All Other	\$100	100	
Total	\$262	263	

5.2.5 Financial Services

To estimate the contribution of this sector to the value of the market-making internet we first analyzed the digital activities of the top three retail banks in the U.S. (**J.P. Morgan Chase, Wells Fargo, Bank of America**) which represent 24% of all U.S. banking activity. Using industry reports we then made calculations for an ‘All Other’ category for U.S. banks and their digital activities. We then made aggregate estimates of digital revenue and employment for the credit card and non-bank consumer financial services sectors.

Banks are not wholly internet-dependent market makers. They perform functions that operate on proprietary data platforms such as asset management, administration, and assessment of credit risk for mortgage and other loans. Further, only a proportion of the revenue earned for market-making is internet dependent, just as is the case for retailers, because they purchase services for resale from suppliers such as Fiserv covered in Chapter 4, and we would be double counting if these costs were not subtracted from revenue. What is most clearly market-making internet activity is customer acquisition and provision of online customer services. Gross income for the top three banks is \$283 billion for the most recent year. By examining the SEC filings of the top three banks and eliminating revenues likely not attributable to the internet, we are left with 5.5% of gross income to be included in Table 5.2.5. We estimate that this revenue is staffed at \$500,000 per employee.

We assume that banks beyond the top three in the U.S. are less internet dependent and earn internet-dependent revenue and hire internet-dependent employees at half of the same proportions.

For **credit cards**, our assumptions are based on the internet-dependency of credit card industry being limited to customer acquisition and retention, using digital tools such as search, SEO, and display advertising, as well as targeted ads on social platforms. According to industry analysis the U.S. credit card industry had \$99.4 billion in revenues across 187 businesses in 2020, with \$4.2 billion spent on



advertising.²⁸⁵ Using the industry standard of 54% of advertising as digital²⁸⁶ we estimate \$2.268 billion as the internet dependent estimate and use an industry benchmark of \$400,000 productivity per employee to arrive at our employment estimate of 5,670.

We take it to be the case that **fintech** and **digital currency** firms are wholly internet dependent, and so we report their entire U.S. revenues and employment in Table 5.2.5. Fintech firms that have matured since our 2016 report include **Square**, with just under \$5 billion in revenues in 2020, **Stripe**, with approximately \$1 billion,²⁸⁷ and **Plaid**, with approximately \$200 million.²⁸⁸ Other U.S. fintech firms with popular fintech products and services include **2checkout** (owned by Verifone), **Braintree** and **Venmo** (owned by PayPal), **WePay** (owned by J.P. Morgan Chase), **Authorize.net** (owned by Visa), **Cash** (owned by Square), and **Credit Karma** (owned by Intuit), which offers personal finance and credit report services free to consumers while earning revenue through targeted advertisements placed by lenders. Other firms mentioned above are accounted for either in the calculations of their parent companies or in the 'All Other' calculations of the fintech, banking, and credit card sectors.

New consumer-centric fintech products and services have appeared more recently. One product is buy now pay later (BNPL) offered directly to consumers or resold by banks. BNPL companies such as Affirm, Splitit, and Quadpay allow consumers to divide purchases into a series of payments without consumers paying any of the carrying costs. Another is payment for order flow (PFOF), which enables fee-free stock trading such as that offered by the commission-free Robinhood app, and micro-trading apps such as Stash.com that sell fractional shares of investment vehicles for as little as \$5 per trade. Other recent innovations in this sector include the integration of digital cryptocurrencies into the activities of major financial institutions such as the oldest U.S. bank, BNY Mellon, the appearance of digital only neobanks such as **Chime** and **Oxygen** that cater to the unique financial needs of freelance and gig economy workers, and banking apps with gamified features such as **Yotta**.

The past year has also seen a rise in consumer investment products that use blockchain-based cryptocurrencies and non-fungible tokens (NFTs). Among the larger companies operating in this space is San Francisco-based **Coinbase**, the largest cryptocurrency exchange by volume in the U.S. It saw its revenue surge from \$191 million in Q1 2020 to \$1.8 billion in Q1 2021.²⁸⁹ By Q2 2021 cryptocurrencies had become the fifth most circulated currency in the world with a value of over \$2 trillion.^{290 291} Such activity is part of a longer term movement known as DeFi, short for decentralized finance, an umbrella term covering new services that replace conventional intermediaries such as banks (e.g., lending platforms that use smart contracts on the Ethereum blockchain to automate and execute their services).²⁹²

For our fintech, digital payments, and digital currencies section in the table below we use a benchmark for revenue per employee. We performed an individual analysis of the top 10 U.S.-based fintech firms, and then aggregated the revenue and employment for the long tail of this sector, reported to be made up of approximately 10,000 firms in the U.S.²⁹³ Table 5.2.5 indicates that the top 10 firms account for \$17,488 billion and 22,807 employees. Deloitte estimates global fintech revenue of \$126 billion, of which



\$49 billion is earned in the Americas.²⁹⁴ We take 80% of \$49 billion to arrive at our estimate of \$39.2 billion for U.S. fintech revenues, and then deduct revenue of the top 10 firms to estimate the ‘All Other’ category of U.S. fintech firms at \$21.7 billion. Using the ratio of revenue to employment that skews toward the service-based companies in this sector (e.g., Robinhood and Lending Club), which have significantly lower revenues than payment processors and brokers (e.g., Square and Coinbase), our assumption is \$500,000 per employee.

Table 5.2.5 Banking, Fintech, Digital Payments, and Digital Currencies

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Banking and Credit Cards			
3 Largest Banks	\$15,565	31,130	
Banks (All Other)	\$32,427	64,854	
Credit Card Roll Up	\$2,268	5,670	
Fintech, Digital Payments, and Digital Currencies			
Intuit	\$7,315	10,070	94043
Square ²⁹⁵	\$4,900	4,815	94103
Coinbase ²⁹⁶	\$1,140	1,249	94104
Stripe	\$1,000	512	94103
Robinhood ²⁹⁷	\$682	1,281	94025
SoFi ²⁹⁸	\$621	1,600	94105
Chime ²⁹⁹	\$600	230	94104
Kabbage ³⁰⁰	\$400	500	30308
Avant ³⁰¹	\$316	550	60601
Lending Club ³⁰²	\$314	1,500	94105
Plaid ³⁰³	\$200	500	94103
All Other	\$21,700	67,800	



Summary of Results in Financial Services and Financial Services Support

We examined how these two sectors have grown across the 12 years of our reporting. It is clearly one of the remarkable successes of the internet ecosystem. In 2008 we did not break out any financial services activity. Even banking made no significant use of the internet pathways, possibly because of concerns over security and because proprietary IT systems performed much of the work of managing data flows. In 2012 we estimated the employment of app developers in banks but saw no significant development of non-bank internet products or services in public filings. By 2016 the volume of entrepreneurial consumer service and B2B activity was inescapable, as the following chart makes clear.

	2008	2012	2016	2020
Financial services support				
Revenue (\$M)			\$2,244	\$22,602
Employment			7,569	63,990
Financial services				
Revenue (\$M)			\$26,292	\$89,448
Employment		6,965	72,233	192,261
Total employment	negligible	6,965	79,802	256,251
Growth over 4-year interval			1,046%	221%

While some of the growth may be due to undercounting in 2012, the internet’s impact on banking and other financial services is currently one of the brightest spots in the internet ecosystem.

5.2.6 Emerging Sectors

While fintech covers sectors such as real estate, insurance, and regulatory compliance³⁰⁴ other fields have emerged in which online marketplaces and internet dependency have merged more recently, such as health tech³⁰⁵ (e.g., CloudMedX, Augmedix, Pilleve, and Teladoc), Prop Tech for the real estate industry³⁰⁶ (e.g., Vreasy and Ribbon), and Legal Tech (e.g., Docusign, RocketLawyer, Avvo, and LegalZoom). To account for these developments, we add a revenue and employment estimate of \$71.2 billion to our calculations, with the following rationale: Based on industry analyses, we assume \$48 billion for the U.S. health tech industry, \$9 billion for legal tech in the US, and add \$14.25 billion, or 25% of the sum of health



and legal tech, to account for activity in the ‘All Other’ category.³⁰⁷ Our employment estimates are derived from assuming \$500,000 productivity per employee, benchmarked on similar industries.

Table 5.2.6 Emerging Sectors

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees
Health Tech	\$48,000	96,000
Legal Tech	\$9,000	18,000
All Other	\$14,250	28,500
Total	\$71,250	139,000

5.3 Platforms

Retail platforms are covered in the ecommerce section. In the section that follows we cover other buyer-seller matching service companies, and, in another section, the sellers who use them to find employment.

5.3.1 Platform Companies Other Than Retailers

A platform is a particular kind of business that has at least two kinds of customer. The platform matches customers on one side of the platform to customers on the other. Platforms occur in such diverse domains as transportation, accommodation, food and package delivery service, and household and professional services. In industry parlance this business structure, that brings multiple vendors and multiple buyers together in a centralized online platform, is sometimes called Service as a Product, or SaaP.

Each day the matching of hundreds of millions of rides, rooms, packages, and services take place between service producers and consumers, enabled by the apps and algorithms of firms such as Uber, Airbnb, Upwork, and Instacart. As a result, millions of Americans earn income as drivers, hosts, service providers, and freelancers, and consumers are provided with options not previously available to them. In addition, new markets in convenience and optionality are built on globally distributed service providers and largely crowd-sourced reputation. Our estimates for the U.S. revenue and employment of platform-based businesses appear in this section and the table below, while our estimates for the platform-based employment of individual Americans appear in Section 6.3.2.



The most common name in the services-on-demand/platform company is **Uber**, as witnessed in the popular “We’re Uber for X” descriptor often used by startups around the world as they pitch investors on their idea to add an on-demand or shared asset component to new sectors. Uber’s share of the ride-hailing market in the U.S. has fallen from 75% at the time of our last report four years ago to 67% by mid 2021,³⁰⁸ and perhaps in response to the competition has embarked on a program of growing beyond its original core to include a wider array of transportation and delivery services. It describes these segments in its annual report as mobility, delivery, freight, and advanced technologies.

Not surprisingly, Uber’s passenger services segment was significantly affected by COVID-19, with its 2020 10-K filing revealing a 24% decrease in ride-hailing revenue. On the upside was the increase of 200% for **Uber Eats**, the company’s food delivery service, which filled the gap created by the closure of dine-in options during the pandemic. Since our last report four years ago has made several acquisitions, including transportation software companies Routematch and Autocab, Dubai-headquartered on demand ride company Careem, food and convenience item delivery services **Cornershop** and **Postmates**, and alcohol delivery service **Drizly**. Our analysis of the company’s financials led us to our estimate of \$6.08 billion of U.S. revenues and 9,000 employees. Note that this estimate does not include Uber drivers, which are reported in the section on platform employment that follows this one.

The other approximately one third of the U.S. ride-sharing market is the domain of **Lyft**. Like its competitor Uber, Lyft was significantly affected by COVID-19, with its financials reporting a 35% decrease in revenues year-over-year. Unlike Uber, however, Lyft is not a diversified firm. As per the company’s annual filing for 2020: “We generate substantially all our revenue from our ridesharing marketplace that connects drivers and riders.” Furthermore, Lyft has not yet achieved significant penetration into international markets, with company financials specifying that the firm “did not generate material international revenues and as of December 31, 2020”, despite having offices and/or operations in Canada, the UK, Germany, and Belarus. We therefore attribute 98% of reported revenue to the U.S. and estimate that 90% of the company’s employees are U.S.-based.

While some were negatively affected by the pandemic, there were others that flourished, particularly those that deployed apps to facilitate the on-demand delivery of groceries and restaurant take-out food. In the U.S. in 2020 the firm with the highest revenues in this sector was **DoorDash**. Its financials report a revenue increase of 241% for 2020. At the time of our last report in 2016 DoorDash had just 5% market share in U.S. food delivery. Now it enjoys 45% market share.³⁰⁹ With operations in the U.S., Canada, and Australia, company filings indicate that 99.6% of DoorDash’s revenue is U.S.-based.³¹⁰ Restaurant delivery competitor **Grubhub** is an aggregator connecting over 30 million diners with hundreds of thousands of local restaurants across more than 3,000 U.S. cities. Its portfolio of brands includes **AllMenus**, **LevelUp**, and **Seamless**. Year over year, Grubhub saw a revenue increase of 39%. The firm was acquired by British/Dutch company Just Eat Takeaway at the end of 2020, with operations continuing to be headquartered out of Chicago. As the company operates its deliver services exclusively in the U.S. market, we consider all of its 2020 revenue of \$1.82 billion as being U.S.-based along with the 2,841 company employees reported in company financial filings.



Another platform that became indispensable for millions of Americans during COVID-19 was **Instacart**. The groceries-on-demand company went from losing \$25 million per month in 2019 to increasing revenues by over 50% in 2020, becoming profitable, and first tripling, then quintupling, the number of shoppers it employed year over year. As Instacart is privately held our estimates are based on published sources reports, which indicate \$1.5 billion in revenue for 2020 on \$35 billion in sales.³¹¹ We attribute 90% of revenue to the U.S., as the company also operates in Canada, and estimate employment at the same ratio of employment to revenue as category competitor Grubhub.

The next of the large platforms analyzed in this section is **Airbnb**, the company that began its life as an air mattress and a few boxes of cereal in the co-founders' San Francisco apartment at the end of 2007, and now has a market cap greater than that of Marriott, Hyatt, and Hilton combined.³¹² Consistent with others in the travel and hospitality industry Airbnb experienced a significant revenue decline during the pandemic, with a 30% year-over-year decrease reported in company financials. Whereas 2019 saw 272 million bookings for Airbnb, 193 million were recorded for 2020. With seven million listings, Airbnb's inventory is equal to close to half of the world's estimated number of hotel rooms,³¹³ with 660,000 of the listings reported as being in the U.S.³¹⁴ Based on the company's S-1 filing that contained financial information for Q1, Q2, and Q3 2020, our estimates annualize the figures to arrive at \$1.036 billion in revenue and 788 employees as U.S.-based.

Competitors to Airbnb include firms such as Booking.com, HomeAway, and VRBO, already covered in the section on online travel. Note that the latter two are owned by Expedia Group and are therefore covered in that firm's entry in this study. A relatively new and independently owned competitor to Airbnb is **Sonder**. Founded in 2012, the company now operates in 30 cities, with approximately 5,000 upscale, fully-serviced properties that emphasize modern architectural design and amenities. Sonder is headquartered in San Francisco and the company has offices in 20 U.S. cities and 15 cities internationally.³¹⁵ Our revenue estimate is based on reports of global revenue from 2019. Based on an analysis of corporate locations and industry benchmarks, we attribute two thirds of company employment of 869 to the U.S. to arrive at our employment estimate of 574.

Our analysis then moves to platforms that connect businesses with freelancers, in fields ranging from business consulting, accounting, and contract law to logo design, app development, and video and audio production. The largest in this sector is **Upwork**, which describes itself as "the world's largest work marketplace that connects businesses with independent talent, as measured by Gross Services Value (GSV)."³¹⁶ In its 2020 financial filings Upwork reported \$2.52 billion of GSV, with the U.S. representing approximately 73% of the clients seeking contract-based talent and 27% of the freelancers seeking work. The company generates fees from both the businesses and the freelancers. Upwork's initial focus was primarily credentialed professionals that are employed on a project-by-project basis (e.g., software developers, economists, and mechanical, chemical, or structural engineers), and more recently began matching companies with freelancers specializing in such fields as influencer marketing, travel writing, and resume creation. Its talent marketplace revenue is reported as \$374 million, of which they report \$168 million as fees generated by U.S. freelancers and clients.



The last platform we analyze individually in this cohort of firms is **Fiverr**, so named as when it launched in 2010 it employed the gimmick of letting sellers charge for their services at a price point of as low as five dollars. However, most freelancers on Fiverr can earn between a few hundred and a few thousand dollars for digital side hustle work such as website and app building and search marketing optimization services.³¹⁷ The platform services over 3.4 million customers across more than 160 countries. Company financials reported 2020 global revenue of \$189.5 million, a year-over-year increase of 77%.³¹⁸ We estimate 45% or \$85.5 million to be U.S.-based revenue. Headquartered in Tel Aviv with four satellite offices in Europe and one in Central America, Fiverr maintains offices in four U.S. cities: New York, San Francisco, Orlando, and Phoenix.³¹⁹ Our estimate for U.S. employment is therefore 20% of total reported company employment of 400.

We also note that **TaskRabbit**, a platform company included in our last report 2016 was acquired by Ikea in 2018. Its revenue is estimated to be less than \$10 million annually and therefore is accounted for in our 'All Other' category, and the estimated 140,000 'taskers'³²⁰ that provide freelance labor for the company are included in the section of this study on platform employment that follows this one.

Table 5.3.1 Platform Companies Other Than Retailers)

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Uber ³²¹	\$6,080	9,000	94158
DoorDash ³²²	\$2,875	3,870	94107
Lyft ³²³	\$2,310	4,208	94107
Grubhub ³²⁴	\$1,820	2,841	60602
Instacart ³²⁵	\$1,350	2,107	94105
Airbnb ³²⁶	\$1,036	788	94103
Sonder ³²⁷	\$400	574	94103
Upwork ³²⁸	\$168	500	95054
Fiverr ³²⁹	\$86	80	10013
All Other ³³⁰	\$161	2,397	
Total	\$16,286	26,365	



5.3.2 Independent Workers on Platforms Other Than Retail Platforms

In addition to the 26,000 jobs in non-retail Internet platforms like Airbnb, Uber, DoorDash, and Instacart identified in the previous section, which combine marketing and business-process-support functions, we find that these platforms sustain more than 632,000 full-time-equivalent jobs. At a full-time equivalent wage rate of \$55,000, these independent workers added nearly \$68 billion to the U.S. GDP.

As evidenced in the preceding section on platform businesses, on-demand products and services, facilitated by apps and the internet, have expanded greatly since our last report. In addition to the first wave of platform businesses that comprised ride-hailing, room-sharing, and food delivery, we now see the platformization of skilled labor. Rather than having to find contract jobs on their own, journalists, industrial designers, software engineers, architects, lawyers, and even medical researchers can use the matching capabilities of platforms to source project-based work from around the world. In addition, a new market has emerged for individuals interested in turning their expertise into online courses and workshops, using the digital toolkits of companies such as Kajabi and Udemy. One-on-one tutoring and online therapy are now also accessible via the web and apps, providing modular work opportunities for practitioners, and valuable and more convenient services for clients.

In this section we estimate the number of people who find project-based and task-based work on platforms operating on the internet. It is estimated that over 50 million Americans partake in some manner of part-time work³³¹ but that figure does not tell us how many hours each person works at their side gig, or the extent to which their work is dependent on the internet. It is therefore important to acknowledge the complexities of making such estimates, due to factors such as the limitations of non-employer-based work data from sources such as the Bureau of Labor Statistics (BLS) or the U.S. Census. Third party reports on freelance workers and related economic impacts in the U.S. were also consulted, though these studies did not evaluate the freelance services performed in terms of internet dependency.³³² One did, however, estimate that 85% of side gig workers earn less than \$500 per month, except for Airbnb hosts, who earn close to \$1,000 per month on average. These figures were based on an analysis of two years' worth of data from tens of thousands of loan applications from self-employed/freelancers.³³³

For our estimates we therefore created a combination bottom-up and top-down methodology that blends data from our analyses of companies' financial filings with third party research reports.³³⁴ We then applied this methodology to our analysis of workers for the most common platform-based businesses in the U.S., and then added an 'All Other' category to account for workers on smaller platforms to arrive at our full-time equivalent estimate of 632,508.



Platforms and Categories:

- Airbnb hosts
- Amazon Flex drivers
- DoorDash and Grubhub delivery people
- Fiverr freelancers
- Instacart shoppers
- Online course instructors
- Online therapists
- TaskRabbit 'taskers'
- Uber and Lyft drivers
- Upwork workers
- 'All Other' category for smaller niche-oriented platforms (e.g., Getaround, Catalant, and Sonder)

The sources consulted tended to report the total number of workers using the platforms, and in most cases, these are part-time workers. We therefore make an adjustment, as we have done in other sections, to figures for full-time equivalent (FTE) employment. We base the ratio of FTE per worker on our reviews of public source documents and online discussion boards in which information on platform-based employment is shared. We estimate \$55,000 per annum for FTE's, based on the Social Security Administration's average wage index.³³⁵ Further calculations and assumptions are detailed in the footnotes for each category below.



Table 5.3.2 Independent Workers on Platforms Other Than Retailers

	Average Monthly Earnings	Average Annual Earnings	FTE Earnings	Percent of FTE per Worker	Number of Workers	Number of FTE Employees
Airbnb ³³⁶	\$924	\$11,088	\$55,000	20.2%	660,000	133,056
Amazon Flex ³³⁷	\$1,300	\$15,601	\$55,000	28.4%	250,000	70,913
DoorDash ³³⁸	\$229	\$2,748	\$55,000	5.0%	103,666	5,180
Grubhub ³³⁹	\$229	\$2,748	\$55,000	5.0%	163,474	8,168
Fiverr ³⁴⁰	\$103	\$1,236	\$55,000	2.2%	37,500	843
Instacart ³⁴¹	\$630	\$7,560	\$55,000	13.7%	450,000	61,855
Online course instructors ³⁴²	\$45	\$540	\$55,000	1.0%	140,000	1,375
Online therapists ³⁴³	\$525	\$6,300	\$55,000	11.5%	42,000	4,811
TaskRabbit ³⁴⁴	\$110	\$1,320	\$55,000	2.4%	140,000	3,360
Uber ³⁴⁵	\$364	\$4,368	\$55,000	7.9%	2,150,000	170,749
Lyft ³⁴⁶	\$370	\$4,440	\$55,000	8.1%	1,370,000	110,596
Upwork ³⁴⁷	\$309	\$3,708	\$55,000	6.7%	60,861	4,103
All Other ³⁴⁸		\$6,166				57,501
Total		\$67,823			5,567,501	632,510



5.3.3 Creator Economy

‘Creator Economy’ has been one of the catchphrases of the past year. This is because there are now tens of millions of amateur and professional creators around the world using the internet to reach both niche and broad audiences. As a result, an ecosystem of performers, platforms, apps, and tools is taking shape that goes well beyond the system of YouTube creators, or YouTubers, examined in our earlier reports. The creators examined in this section can be one person businesses, or work in small groups, and use a variety of platforms and apps (e.g., YouTube, Instagram, Snapchat, TikTok, Twitch, and SoundCloud) to communicate directly with fans and followers.

Those who work as employees are counted elsewhere in this report. Just as the infrastructure that supports ecommerce firms also lets individuals sell their home-made goods online, so the infrastructure that supports entertainment industries also lets talented individuals go direct to their audiences. Note that we exclude from this section of the report people who, while individual creators, are counted elsewhere. For example, Etsy sellers are sellers of goods and so counted in ecommerce. People who deliver online courses for credit are counted in Online Education.

In the analysis that follows we will lay out an argument that, from a pool of two or three million people working full and part-time as creators in the U.S., wealth is being created that is equivalent to 200,000 people working full time and earning the SSA average wage annually. This number has grown from the full time equivalent of 35,000 self-employed digital content creators operating on, essentially, only one platform (YouTube) in our 2016 report, and in 2012 our estimate was 1,000.

This economic engine has attracted venture funding estimated in the range of \$800 million to \$2 billion in the past year.³⁴⁹ The funding has supported two kinds of business: companies that offer tools to creators, and a proliferation of platforms, some of which pay some of the venture funds directly to content creators in the hope of attracting audiences to the platforms. We analyze the creator economy as the sum of the people self-employed as creators and employed in tool and platform firms.

The tools companies help creators create, upload, distribute, market, and monetize content, and provide administration and financial services, and in a few cases create non-fungible tokens from content. Examples of these tools companies are Splice, Beatstars, Stem, Tunecore, Distrokid, Ditto, CD Baby, Indify, Canva, Unsplash, Anchor, Megaphone, Stir, Karat, Creative Juice, Rally.io, Muserk, Spring, and Pietra. We exclude influencer marketing agencies because they are included in the advertising agency section of this report.

The platform companies are of two kinds. First, there are those where the primary relationship is between platform and audience. Creators post to these platforms and monetize through advertising, in-platform or purchases, subscriptions, and premium plans. Examples are Alphabet’s YouTube, Facebook’s subsidiary Instagram, Amazon’s Twitch, Roblox, and short video platforms such as TikTok and Snapchat.



On the second kind of platform the primary relationship is between creator and audience. The audience pays the creator, and the creator pays the platform either a percentage of audience revenue or a flat fee. Examples are Bandcamp and Sessions in music, Substack and Twitter’s Revue in newsletters, Kickstarter and Patreon in crowdfunding of creators, and Medium and Cameo.

There are three large concentrations of workers in the self-employed creator economy. The first is in the music industry, the second is a group of people who play games online and provide commentary for an audience, and the third is people with specialized knowledge who write newsletters. Smaller groups of creators work in fields such as online art and photography, fitness and personal training, and podcasting, though most of the large-audience podcasts are not created by self-employed people. Creators earn revenue from a share of platform ad revenues, paid subscriptions, sponsorship and product placement by brands, tips from followers, and sales of both digital content and merchandise.

To generate our estimate of how many people work as self-employed creators in the U.S., we critically reviewed five studies.

The first is by Re:Create from 2017.³⁵⁰ Although three years out of date in a fast-growing field, its methodology is fully disclosed. It attributed income to creators on each of nine then popular creator economy platforms, and when the income was divided by the SSA average income the study estimated 2017 FTE employment of 123,539 people. Note however that now-important platforms such as Spotify, TikTok, and Wattpad were not counted, and there is no allowance for posting to multiple platforms. The analysis can be summarized as follows:

Platform	Annual Revenue in 2017	FTE Annual Income (\$)	Creative Workers
Amazon publishing	220,447,368	\$55,000	4,008
eBay	36,974,819	\$55,000	672
Etsy	1,458,513,952	\$55,000	26,518
Instagram	460,100,000	\$55,000	8,365
Shapeways	1,701,804	\$55,000	31
Tumblr	178,003,586	\$55,000	3,236
Twitch	87,147,723	\$55,000	1,585
Wordpress	347,737,771	\$55,000	6,323
YouTube	4,004,000,000	\$55,000	72,800
Worker Total			123,539



The second is a 2020 study by the venture fund Signalfire.³⁵¹ It estimates that there are 46.7 million amateur content creators and two million professionals. Despite this generous estimate of worker size this study is less useful for our purposes because it does not give a basis for translating from self-defined creative economy workers to FTE workers. However, it supports the conclusion that the 2017 Re:Create estimate needs substantial updating.

The third study is by Antler, an early-stage venture investor founded in Singapore.³⁵² Again, it gives no basis for a FTE worker estimate but does point to the size of the tool and platform ecosystem supporting creators.

The fourth study is a 2020 white paper on the independent musical artist sector from investment firm The Raine Group.³⁵³ By Raine's definition, "independent artist" refers to artists not signed to record labels. This definition covers three kinds of creative worker: First, it covers artists uploading their own tunes to platforms such as Spotify and YouTube using services such as TuneCore, Ditto, Amuse, and CD Baby. Second it covers creators affiliated with so called mid-tail artist services such as AWAL, Empire, and Believe, who perform services like those that major labels perform for established artists. We exclude established artists from the creator economy because they are accounted for in the online music and audio section of this report, but we do include this second kind of creator because they are self-employed and internet dependent, and not elsewhere accounted for. A third but minor kind of creative worker in Raine's scheme are musicians directly commissioned to create tracks in TV shows, movies, ads, etc. According to Raine's estimates, the creator economy supports the full time equivalent of 36,300 musicians.

Finally, Oxford Economics reports a study of creators on just one platform, YouTube.³⁵⁴ When payments made directly by YouTube to creators are added to off-platform revenues from brands, concerts, and other sources, it estimates that 345,000 full-time equivalent jobs were created in 2019 in the United States. However, these jobs are not all held by self-employed individuals. They include jobs in media companies and music industry firms. We have no way to decide what proportion are jobs in the creator economy as we define it.

To integrate these five snapshots of the creator economy, we first assume that the Re:Create employment continues to grow at the 17% it found between 2016 and 2017. Is that rate of growth plausible for 2017 to 2020? It would give a creator economy work force of 200,000. Assuming the Oxford Economics estimate of 345,000 earners on just one platform is correct, their estimate must be disproportionately skewed toward people employed in media and music companies, and so not creators as we define them, which is not unreasonable. The Raine study satisfies us that self-employed musicians (36,300) is not so large as to distort the Re:Create projection. The Information³⁵⁵ reports influencers earned \$2.76 billion from advertising (including sponsorships) in 2020, implying that the FTE influencer workforce was 50,200, also not so large as to distort the Re:Create projection. We conclude that full-time equivalent workers total 200,000 people.



To complete this section, we estimate employment in tool and platform companies. Most of the platforms are large companies like Facebook, Amazon, and Google, reported elsewhere. We roll up the other platform and tool firms. The larger firms include Patreon, Kickstarter, Bandcamp and Tunecore, whose combined global revenues are \$1.95 billion, half of which we estimate are earned in the U.S. Another \$400 million is estimated to come from smaller tools and platforms, almost all earned in the U.S. We conclude that platform and tool employment is estimated at 25,000 people.

Table 5.3.3 Creator Economy

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees
Self-employed creative workers	\$11,100	200,000
Platform and tool firms	\$1,375	25,000
Total	\$12,475	225,000

5.4 Social Networks and Services

5.4.1 Social Media Sites

Since its first appearance in the early 2000s, the definition of social media has expanded. Initially there were dedicated social networking sites, such as Friendster, MySpace, and of course Facebook. More recently, however, the trend has become the integration of features with a social dimension, created directly, through friending or following mechanisms, or indirectly, through algorithmic content discovery that is the product of online actions taken by individuals and groups.

For this section of our analysis the top social platforms are Twitter, Snapchat, and Pinterest, which have been individually analyzed below. The largest social platform, Facebook, is accounted for in our section on integrated firms, to which Facebook belongs due to its business operations expand beyond social media, such as VR technology company Oculus, Filesharing site Drop.io, and travel recommendation service Nextstop. LinkedIn, for business social networking, is accounted for in our analysis of its parent company Microsoft, and Twitch is accounted for in our analysis of Amazon, both of which appear in our section on integrated firms.

For **Twitter** our estimate is \$2.08 billion in U.S. revenue for 2020 and 3,080 U.S. employees. The company’s recent acquisitions include newsletter platform Revue, podcasting app Breaker, subscription-based, ad-free content tool Scroll, and video chat app Squad, for which it has been reported that both advertising-based and subscription-based business models are being explored in order to diversify the company’s revenue base.³⁵⁶ Of the company’s \$3.72 billion in global revenue in



2020, \$3.21 billion, or 87%, was derived from advertising, primarily in the form of promoted tweets, promoted trends, and promoted accounts, with \$509 million in revenue coming from data licensing.

Our U.S. revenue and employment estimates for **Snapchat** are \$1.48 billion and 2,295 respectively, with the U.S. representing approximately 60% of the firm's global revenue. Worth noting is the app's resilience, even as some of its key features have been cloned by competitors such as TikTok and Instagram. The last reported figure for average number of snaps posted per day is more than five billion,³⁵⁷ a doubling since the time of our last study four years ago.³⁵⁸ As is the case with several platforms powered by user generated content (UGC), the company has recently embarked on programs that incentivize creators with direct payments, brand partnerships, and custom filters.³⁵⁹

The third of the major social platforms we analyze in this section is Pinterest, referred to by its co-founder as "the last positive corner of the internet,"³⁶⁰ with its top searches during COVID-19 including such topics as at home skin care, casual/leisure wear, and meditation. Shoppable posts are a natural fit for the platform, and the company's Q4 2020 letter to shareholders reported an increase in sales of 76% and all-time highs for global engagement.³⁶¹ For full year 2020 Pinterest reported \$1.4 billion of \$1.69 billion global revenues as U.S.-based. With six offices in the U.S. and seven abroad, we estimate that most employees are U.S.-based to arrive at our U.S. headcount figure of 2,087. While there is debate whether TikTok is a social network, for our purposes of classifying, mapping, and measuring we include it here. TikTok revenue and employment are estimated by analogy to Pinterest because it is a subsidiary of a China-based company.

The 'All Other' section is not large. We estimate its revenue at \$350 million. **Clubhouse** is a social network meets chat app for groups large and small. As technology analyst Benedict Evans put it: "Clubhouse is interesting. It disrupts podcasts from one side and Twitter from the other." The business model is still evolving but is said to eschew ads and focus instead on payments to creators, with the platform taking a cut, though brand deals with influencers are starting to emerge.³⁶² As of mid 2021 Clubhouse reported 10 million users, approximately a dozen employees, and a valuation in excess of \$4 billion.³⁶³

Triller, owned by film and TV production and distribution company Proxima Media, is not a name known to all that many, but it was the most downloaded app in mid 2020 when a TikTok ban was being discussed by the U.S. government. The company has a valuation more than \$1 billion, with estimates for revenue and employment at \$25 million and 238 respectively.³⁶⁴ A new form of social media is audio-based. Among the entrants is Peanut, a social networking app for moms that recently launched Peanut Pods, its live audio room feature,³⁶⁵ and entrepreneur Mark Cuban is behind Fireside, described as a "a platform where creators will be able to broadcast, record, and monetize conversations while using Fireside's built-in analytics tools to figure out what content performs best."³⁶⁶



Table 5.4.1: Social Media Sites

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Twitter ³⁶⁷	\$2,080	3,080	94103
Snapchat ³⁶⁸	\$1,480	2,295	90405
Pinterest ³⁶⁹	\$1,400	2,087	94107
TikTok ³⁷⁰	\$700	1,085	90232
All Other	\$350	600	
Total			

5.4.2 Online Dating

Online dating was one of the earliest businesses to thrive on the internet, with pioneering sites such as Match.com in the mid 1990s leading to a flowering of specialized sites catering to specific interests/hobbies, ethnicities, and religions. By 2020 online dating had emerged as another long tail business on the internet, with the top three companies—Match Group, eHarmony, and Spark Networks—accounting for 46% of global industry revenues estimated at just under \$4 billion, and the remaining 2,000 or more firms in the sector representing the remaining 54%.³⁷¹

At the time of our last report in 2016 the largest of the top three, Match Group, was a division of IAC, and therefore appeared in the multi-genre and multi-platform section to reflect the broad base of IAC’s online activities such as Ask Media Group, Care.com, Dotdash, and Investopedia. In mid 2020 Match Group became a separate corporate entity, trading under its own ticker, with a portfolio of online dating brands including **Match.com**, **OKCupid**, **Tinder**, **PlentyOfFish**, **Hinge**, **Meetic**, **Pairs**, and **OurTime**.³⁷² In the company’s most recent SEC filings, Match Group reported \$2.4 billion in global revenue and \$1.18 billion in North American revenue, of which we attribute \$1.06 billion to the U.S. The majority of the firm’s revenues (98%) are generated by direct revenue (e.g., subscriptions, in app purchases, and bundles of paid features). Match Group represented 28% of global industry revenues in 2020.

The second largest of the online dating sites is eHarmony, differentiated with its emphasis on longer term relationships and targeting people with higher income and higher education. A privately held company, it is estimated to have had just over \$500 million in revenue in 2020, accounting for approximately 13% of the industry.³⁷³ Rounding out the top three in this sector is Spark Networks, home to over two dozen dating sites that cater to specific ethnic, religious, and demographic communities,



such as JDate.com, BlackSingles.com, SilverSingles.com, and ChristianMingle. In 2019 Spark acquired Zoosk, known for being midway between casual dating sites and marriage-minded sites such as eHarmony. Spark Networks’ 2020 revenues represented approximately 5% of the industry’s revenues in 2020. The long tail of the online dating industry is accounted for in our ‘All Other’ estimate in the table below. There are approximately 2,151 online dating companies that constitute the remainder of the industry, focusing on niches such as CrossFit enthusiasts, vegans, and people interested in paranormal phenomena. Our estimate for this segment of the industry in the U.S. in 2020 is \$2.017 billion in revenue and 2,897 employees.

Table 5.4.2 Online Dating

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Match Group ³⁷⁴	\$1,060	1,800	75231
eHarmony ³⁷⁵	\$503	500	90024
Spark Networks ³⁷⁶	\$155	168	84043
All Other ³⁷⁷	\$2,017	2,897	
Total	\$3,735	5,365	

5.5 Employment and Human Resources

This category covers websites for employment and recruiting for full time work, part time work, and contract-based/freelance work, and the sector of software focused on human resources and payroll administration.



5.5.1 Online Employment and Recruiting Sites

Online jobhunting and recruiting is a multibillion-dollar business made up of over 2,000 companies globally.³⁷⁸ Sites in this sector have a variety of business models and approaches, such as aggregating multiple sites, specializing in niches or verticals, charging for listings or premium placement that in turn make services free to use for job seekers, and most recently, deploying AI and big data analytics techniques to optimize matching between employers and potential hires.

In the U.S. in 2020 the top three firms—**Recruit Holdings (Indeed, Glassdoor)**, LinkedIn, and **CareerBuilder**—accounted for 66% of industry revenues.³⁷⁹ Note that LinkedIn is not included in our estimates in the table that follows as it appears in the ‘Integrated Firms’ section of this report, with its parent company, Microsoft. That said, it is worthy of note here that in the past year LinkedIn reported advertising revenues of over \$3 billion, exceeding the ad revenues of Snapchat and Pinterest, and putting the business networking site’s ad revenues on par with Twitter.³⁸⁰

The primary business model for the largest of the employment sites, Indeed, is pay for performance. With this model recruiters and employers may purchase ads that appear higher in the search returns or are highlighted to stand out. The platform then receives payment from the advertiser when a job seeker clicks on an ad. Indeed’s parent company, Japan-based Recruit Holdings, added employment site Glassdoor to its roster of staffing and business management solutions in 2018. Together, Recruit Holding’s Indeed and Glassdoor represent close to one third of industry revenues.

The remainder of job board sites have low single digit percentage market shares. For example, after Recruit Holdings’ Indeed and Glassdoor, the next largest online employment site is CareerBuilder. It is estimated to account for just under 5% of industry revenues.³⁸¹

Headquartered in Chicago, the business is data-intensive, with over 20 billion data points related to occupations and millions of data points related to workforce profiles and compensation levels. Early online employment site **Monster.com**, once a category leader, now accounts for just over 2% of industry revenues. Since 2016 the Massachusetts headquartered company has been under the ownership of Dutch holding company Randstad. Newer market entrants include ZipRecruiter, another company using AI and analytics to take job boards beyond the model of posting, searching, and paying to promote or highlight ads. According to the company’s VP of Product Strategy, ZipRecruiter “... kind of flips the hiring process on its head. So, when a recruiter is opening up a position, we’re going to use our technology to show them candidates that we think would be a good fit for the role.”³⁸²

The ‘All Other’ category noted in the table below includes specialized online employment firms such as CollegeRecruiter, MediaBistro, Ladders, and DHI Group, operator of employment sites such as ClearanceJobs.com, eFinancialCareers.com, AllHealthcareJobs.com, and Dice.com.



Table 5.5.1 Employment Services

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Recruit Holdings (Indeed, Glassdoor) ³⁸³	\$3,675	7,360	78750
CareerBuilder ³⁸⁴	\$582	1,164	60601
Monster ³⁸⁵	\$284	568	02493
ZipRecruiter ³⁸⁶	\$98	600	90401
All Other ³⁸⁷	\$1,500	6,667	
Total	\$6,139	16,359	

5.5.2 Human Resources Software

Keeping organizations running smoothly, from HR functions such as payroll and benefits to recruiting and employee wellness and personal development programs, is another sector that has become increasingly internet dependent. The software running such systems has come to be known as HCM, or human capital management. Whether delivered on private company intranets or on the open internet, the underlying technologies used are the same, namely the TCP/IP internet protocol suite. In the last few years many enterprise software tools have moved from a company’s internal IT networks to the cloud, in turn simplifying functions such as software and security updates. This shift to the cloud also provides benefits to small and medium-sized businesses, as enterprise software solutions can be accessed in an ‘a la carte’ fashion, through SaaS structures, and at a fraction of the hefty cost of single price enterprise software solutions.

The market forces defining this sector in recent years include automation, globalization, remote work, and outsourcing. Along with these phenomena have come cloud-based software that integrates AI tools such as machine learning and deep learning to optimize functions ranging from talent recruitment and management to salary benchmarks and pay equity. In this sector the top three providers we analyze—**ADP** (Automatic Data Processing), **Workday**, and **UKG** (Ultimate Kronos Group) and—represent just over half of the market. Note that other large firms that also operate in this space, such as Intuit, SAP, Oracle, and Microsoft, are accounted for in the relevant sections of this report.

The largest provider we analyze in this sector **ADP**, whose annual report notes \$12.74 billion of \$14.6 billion global revenue as U.S.-based. We assume all company revenue is internet dependent based on



an analysis of reporting segments in SEC filings, such as the company’s Data Cloud workforce analytics solution that provides business insights that inform HR decisions, its Skills Graph proprietary data | structure based on more than 30 million employee records and 50 million resumes across 500 geographic areas, and its Model-Based Benchmark that uses deep learning models to identify patterns from millions of payroll records and job profiles. The next largest firm is **Workday**, for which our estimate is \$3.25 billion of U.S. internet-dependent revenue and 9,375 employees. Rounding out the top three is **UKG**, or Ultimate Kronos Group, a merger of Ultimate Software and Kronos Incorporated that occurred in April 2020, making UKG one of the largest cloud computing firms in the world. UKG has dual headquarters—one in Lowell, Massachusetts and the other in Weston, Florida. The company reported approximately \$3B in revenue in 2020³⁸⁸ and 12,000 employees across 165 countries.³⁸⁹ Based on industry benchmarks we assign half of employee headcount, or 6,000 employees, and a similar proportion of revenues to the U.S.

Our analysis then moves to the mid-sized providers in this space, such as **Paycom**, **Paylocity**, **Ceridian**, and **Ellucian**, all of which deploy secure cloud-based architectures and data-intensive SaaS offerings to businesses large and small. In our ‘All Other’ category for companies with revenues at the sub-\$100 million level, we factor in innovative startups such as **BambooHR**, **Zenefits**, and **Intrro**.^{390 391}

Table 5.5.2: Human Resources

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
ADP (Automatic Data Processing) ³⁹²	\$12,740	50,460	07068
Workday ³⁹³	\$3,250	9,375	94588
UKG (Ultimate Kronos Group)	\$1,500	6,000	01851-3326
Paycom ³⁹⁴	\$841	4,218	73142-1404
Paylocity ³⁹⁵	\$561	2,600	60173
Ceridian ³⁹⁶	\$503	3,487	55425
Ellucian ³⁹⁷	\$162	1,500	20191
All Other	\$1,000	5,000	
Total	\$20,557	82,640	



5.6 Integrated Firms

Until this point in the report, all the employment created by the internet has fit into just one of the three layers: infrastructure, support, and consumer services. But not all firms fit into just one layer.

In this section we gather the firms that today cross layers. We use the term integrated firms for them, and often they are also called the tech giants. In our study this group comprises Amazon, Apple, Google, Microsoft, Facebook, and Comcast. We do not include Netflix, Disney, Sony, Dell, and Cisco, which are firms of comparable size, because their activities do not cross layers at present. We also do not include AT&T and Verizon even though they do cross layers, because they have backed off expansion from their infrastructure homes into the consumer services layer and have begun divesting. We do however include Comcast as it combines activities in the infrastructure layer with others in the content production and distribution layer. Three of the firms—Microsoft, Apple, and Comcast—were founded before the internet and managed the transition from the personal computer or television age to the internet age. The other three — Amazon, Google, and Facebook—were born during the internet age.

There is no reason to think that the number of integrated firms is fixed. In fact, it may be inevitable, given the low cost of exploiting complementarities among data sources and data tools, that as firms grow, many of them will expand across the layer boundaries.

Despite these different origin stories, the firms in this section are all platforms that allow multiple stakeholders to collaborate, share, and build. This marks a striking shift from the earlier era of locked down software and hardware technologies and one characterized by platforms that enable millions of third-party sellers, developers, content creators, and on-demand workers.

It was the convergence of powerful devices, robust networks, and apps that brought everything from news to banking, shopping, and social networking to the palms of our hands led to the next paradigm in computing. It would be characterized by personalization, increasing consumer choice, and an experience that spanned multiple devices. Companies that were able to meet consumer demand for user experiences that merged connectivity with convenience and opened up choice and participation to individual users were the ones that emerged as winners.

Amazon: What began as a vision for the world's biggest bookstore became 'The Everything Store,' where goods from diapers to dog food to drill bits could be ordered with the click of a mouse or the swipe of a finger. Since establishing itself as the dominant online retailer, Amazon has become an exemplar of diversification across lines of business. The company has branched out into areas ranging from cloud services to hardware manufacturing to gaming and film and TV production, under brands such as AWS (Amazon Web Services), Kindle, Fire, Echo, Twitch, and Amazon Prime Video.



Amazon’s AWS, its infrastructure as a service offering, powers the data operations of some of the largest online firms (e.g., Netflix, Facebook, and LinkedIn). But as a Forbes article from early 2021 put it: “Amazon’s Third-Party Marketplace Is Its Cash Cow, Not AWS.”³⁹⁸ Indeed an analysis of the company’s SEC filings³⁹⁹ shows that AWS revenues were just 11.7% of total company revenues for 2020. While AWS is a very profitable business for Amazon, the company’s third-party seller marketplace generates far more top line revenue, which is our focus as it accounts most directly to its employment. Marketplace contributes, we estimate, as much as \$120 billion when sellers’ fees, fulfillment fees, and placement and advertising fees are factored in.⁴⁰⁰ Third-party sellers represent 55% of paid unit sales on the platform⁴⁰¹ and number over six million globally.⁴⁰²

Our estimates for Amazon as an integrated firm are based on a review of the company’s SEC filings, which report \$386 billion in net sales for 2020, with net sales covering both products and services sold by the company. As the SEC filing states: “Product sales represent revenue from the sale of products and related shipping fees and digital media content where we record revenue gross. Service sales primarily represent third-party seller fees, which includes commissions and any related fulfillment and shipping fees, AWS sales, advertising services, Amazon Prime membership fees, and certain digital content subscriptions.”⁴⁰³ Of the \$386 billion in global product and services revenue we estimate that 55%, or \$212.7, billion may be attributed to the U.S., based on \$236 billion reported as North American revenue and applying a benchmark of 90% of North American revenue as U.S.-based.

To estimate Amazon’s employment, we deviate from our normal practice of estimating employment without regard to variation around a study average of \$55,000 per job. We deviate because much of its employment is likely well below that annual rate of pay. Amazon’s global employment soared in 2020, from 798,000 full time and part time workers (excluding seasonal workers) at the beginning of the year to 1.3 million by year’s end, and we assume that almost all the half million new employees were warehouse workers whose starting pay was \$17 per hour or \$35,000 per year.⁴⁰⁴ Before discounting, we estimate Amazon’s U.S. employment at 713,900. After discounting we assume it is 568,500.

Apple: Apple has shifted its focus considerably since its days as primarily a manufacturer of consumer hardware for an elite segment of the market. Today Apple is a company with a full range of hardware and accessories (iPhones, iPads, Mac desktops and laptops, AirPods earbuds, Apple Watches, and Home Pod smart speakers), but, relevant to its inclusion in the ‘Integrated Firms’ section, it has a menu of digital services that include apps, music, video, and book downloads and rentals, podcasts, cashless payment, game subscriptions, cloud storage, and pay services. It augments its hardware sales revenue with premium fitness, news, music, and film and TV content. The hardware, content, and services are not only highly interconnected but also available to users outside the Apple hardware product lines in many cases, so we consider all of Apple’s revenue as internet dependent.

It is worth noting that one product, the iPhone, represents just over half of the company’s global revenues with \$138 billion in sales in 2020. When considered together, iPhones, Mac laptops and desktops, and iPads represent 68% of global revenues, services represent 20% (digital content, cloud storage, and payment services), and what Apple’s SEC filings categorize as “Wearables & Home” (e.g.,



Apple Watch, AirPods, HomePod, and Beats headphones) represent 11.5%. Our figures for these calculations and for U.S. internet-dependent revenue and employment in the table below are derived from our review of Apple’s most recent SEC filings,⁴⁰⁵ from which we estimate \$99.6 billion in U.S.-based revenue and 52,920 U.S.-based employment.⁴⁰⁶

Google/Alphabet: Though most used for searching and digital tools and services like Gmail, Google Maps, and YouTube, Google is primarily an advertising business. In 2020, \$147 billion, or 81% of parent company Alphabet’s global revenues came from ads sold across search and display, as well as fees derived from distribution partners. It is this ad revenue that supports the provision of its email, maps, and video on demand for free to consumers. The next largest proportion of company revenues came from what the company classifies as “Google Other.” This category accounted for 11.5% of company revenues and includes app sales and in-app purchases on Google Play, hardware such as Google Nest and Pixel phones, and non-advertising revenue on YouTube such as premium subscriptions that offer an ad-free viewing experience. The remainder of the company’s 2020 revenues came from Google Cloud, which is the company’s competitor to Amazon’s AWS and Microsoft’s Azure. Cloud services represented 7% of income in 2020.⁴⁰⁷

Alphabet also has an “Other Bets” category in their public filing, which represents approximately one half of 1% of revenues and is described as “earlier stage technologies that are further afield from our core Google business. We take a long-term view and manage the portfolio of Other Bets with the discipline and rigor needed to deliver long-term returns.”⁴⁰⁸ Since the time of our 2016 report acquisitions that may be considered part of this category include data science company Kaggle, analytics company Looker, fitness wearables company Fitbit, and smart glasses company North.

Google’s public filings state that 47% of global revenues, or \$85.8 billion, are attributable to the U.S. To estimate U.S. employment, we analyzed the number of U.S. vs. global office locations and to allow for slightly larger employment at the company’s headquarters in California attributed half of global employment, or 67,650 workers, to the U.S.⁴⁰⁹

Microsoft: Founded in 1975, Microsoft is the elder statesman of this category. The company that began as a provider of software for some of the earliest personal computers now has interests in operating systems, hardware, games, cloud computing, VOIP connectivity (Skype), and business networking (LinkedIn), in addition to its personal and enterprise computing software. In the past year Microsoft’s market cap exceeded \$2 trillion.

The company’s public filings show \$143 billion in global revenue in 2020, of which 51%, or \$73 billion is U.S.-based, and identifies 96,000 of the global workforce of 163,000 as U.S.-based. Microsoft divides its reporting segments into three categories: Productivity and Business Processes, Intelligent Cloud, and More Personal Computing, representing 32.5%, 33.5%, and 33.5% of revenues respectively.



Acquisitions since the time of our last report include a variety of game development studios, AI companies, and 5G networking companies. Most notable is the priority the company is placing on open-source development, witnessed by its \$7.5 billion purchase of Github. The code repository is currently used by 65 million developers, three million companies, and boasts over 200 million repositories, making it the world's largest host of source code.⁴¹⁰

Facebook: By now the Facebook story is well-known: It started out in a dorm room at Harvard in 2004 and four years later founder Mark Zuckerberg was the world's youngest self-made billionaire. Today Facebook is one of the world's most valuable companies, with interests that expand well beyond its initial focus of social networking, likes, and shares. The company has made approximately 100 acquisitions since it began, including patents from early social networking site Friendster to a variety of companies involved in businesses ranging from virtual reality to analytics to ad tech and mar tech. The most popular of these acquisitions have become standalone apps that are among the most used in the world (i.e., WhatsApp), while others have become integrated into Facebook with functionality that allows seamless communication between the acquired services and the core Facebook product (i.e., Instagram).

Facebook's SEC filings report \$85.9 billion in global revenue for 2020, of which \$84.2 billion was derived from advertising. U.S. revenue is broken out as \$36.25 billion, representing 94% of North American revenues.⁴¹¹ Facebook had 58,604 global employees in 2020 and offices in 80 cities around the world. Approximately half of Facebook's offices are located in the U.S., and we allocate the company's U.S. employment base accordingly.

Comcast: While historically an internet infrastructure play and the largest ISP provider in the U.S.,⁴¹² Comcast is now pursuing a vision as an integrated firm crossing the lines between distribution and content because it has assets in television content production (NBCUniversal with the Peacock streaming service), motion picture studios, theme parks and resorts (Universal), and Sky Group, a British media and telecommunications conglomerate.⁴¹³ It is contemplating expansion beyond its cable footprint in a manner comparable to Amazon with Fire TV and Roku, and is discussing the launch of a Comcast-branded smart TV later in 2021. While its content ventures are intended ultimately to serve content to this expanded internet reach, at this time much of its employment is not internet-related and therefore we do not place it in the 'Integrated Firms' section. Of total corporate employment of 190 thousand and revenue of \$108 billion, we attribute all its residential broadband internet revenue (\$18.8 billion) and 70% of business services, (\$5.5 billion) along with revenue from Peacock and its stake in Hulu to U.S. internet.



Table 5.6 Integrated Firms

	2020 U.S. Internet Revenue (\$M)	2020 U.S. Internet Employees	Zip Code
Amazon	\$212,700	568,500	98109
Apple	\$99,600	52,920	95014
Google	\$85,787	67,650	94043
Microsoft	\$73,160	96,000	98052
Facebook	\$36,250	29,302	94025
Comcast	\$24,300	42,470	19103
Total	531,797	856,842	



Chapter 6: Calculation of Jobs, Contribution to GDP, and Geographic Distribution of Jobs

Employment is the yardstick by which economic contribution is measured in this study. In this chapter, we combine the employment findings (including self-employment) of the three layers of the internet ecosystem into a whole and use it to estimate the internet ecosystem's sector gross domestic product (GDP). We then show how these jobs are distributed across the U.S. We show this distribution by allocating jobs to the nation's congressional districts.

6.1 Employment

The three previous chapters analyzed employment by identifying the 258 largest firms for individual analysis, each assigned to one of 45 relatively homogeneous clusters. For many of these clusters there were smaller firms, so there we created 34 all other groups of firms and estimated employment in the groups. Additionally, we identified 26 groups of small teams (five or fewer workers) or self-employed individuals for collective analysis. Of these, 26 clusters accounted for self-employed or small team workers such as sellers on Etsy and individual sellers on eBay, on-demand economy workers, and freelance individuals doing coding, content creation, and other services for websites. We also identified and analyzed two clusters of firms that were individually small but large in aggregate: ecommerce merchants beyond the top 10, and people working in small units of large and mid-sized general enterprises not otherwise counted in the internet ecosystem who owed their jobs to the internet.

17.6
MILLION
JOBS

17.6 million jobs are due to the internet
(direct and indirect employment)

The sum of these estimates of employment in the internet ecosystem is 6,941,387 jobs of which 2,400,232 came from the individually enumerated firms. Therefore, our enumeration of large firms produced 35% of the people that we estimate are directly employed in the internet ecosystem.

Each job in the internet ecosystem supports indirect employment, made up of people who work in sectors that service the needs of the jobholder, such as schooling, entertainment, banking, insurance, and retail, paying taxes that support employment in federal, state, and municipal government services, education, and the military. This indirect employment arises from supplier effects, re-spending effects, and government employment effects.



It is standard practice to apply a multiplier to the direct employment to account for the indirect employment that would be lost if the direct employment did not exist. The U.S. Bureau of Labor Statistics (BLS) publishes statistics on industry employment requirements, which enable calculation of these multipliers. Sectors differ in the size of their multipliers. Bivens⁴¹⁴ has computed indirect employment multipliers that range from 372 indirect jobs for every 100 jobs in durables manufacturing to 163 indirect jobs for every 100 jobs in business services. These estimates are inclusive of capital service usage. Hann, Viswanathan, and Koh⁴¹⁵ used a range of multipliers from 2.4 to 3.4 in their analysis of the Facebook app economy, while Mandel used 0.5 in his report on the app economy. We have chosen a conservative multiplier of 1.54, the ratio used in our earlier reports. Thus, we estimate that direct and indirect employment due to the internet ecosystem is 17.6 million.

6.2 Internet Sector GDP

A nation's GDP is the aggregate of incomes received by residents, both individual and corporate, as direct payment for current services to production, plus return on capital. The national GDP can be decomposed into sector GDPs, which measure the economic activity of each sector. We do not have all the inputs needed to do a precise calculation of the internet ecosystem's sector GDP. However, we can produce a reasonable approximation if we treat the sector's employment as an indicator of sector GDP.

To do so, we need an estimate of national GDP in 2020 and an estimate of national and internet employment in the same year. 2020 was a particularly volatile year, because the economy was hit by the global pandemic and GDP declined. Our employment inputs came from SEC filings at dates that ranged across the year, so a judgment was needed to select a national GDP estimate in the range from \$21.43 trillion at the end of 2019 and \$20.93 trillion at the end of 2020.⁴¹⁶ We chose the midpoint, \$21.18 trillion. To estimate national non-farm employment, we do the same: take the mid-point of employment at the start and end of 2020 for 152.67 million.⁴¹⁷

Our method is as follows. We estimate the sector GDP of the internet ecosystem by multiplying national GDP (\$21.18 trillion in mid 2020) by the ratio of the sector's direct and derived employment (17.65 million) to total number of employed persons in the U.S. in mid 2020 (152.67 million).

This method yields an estimate for the internet ecosystem's sector GDP of \$2.45 trillion or 11.6% of national GDP. These estimates compare as follows to our earlier estimates:



Table 6.2.1. National and Internet GDP

	2008	2012	2016	2020
Employment (millions)	3.05	5.1	10.38	17.65
National GDP (\$ trillions)	\$14.71	\$16.20	\$18.68	\$21.18
Internet GDP (\$ trillions)	\$0.30	\$0.53	\$1.12	\$2.45
Annual growth in national GDP		3%	2%	3%
Annual growth in internet GDP		16%	20%	22%
Internet GDP as percent of national GDP	2%	4%	6%	12%
Growth of internet GDP relative to national		5.3	8.3	6.7

6.3 Distribution of Jobs Across U.S. Congressional Districts.

We use the top-down method of estimating internet-related jobs described in the methodology section. We do not use the bottom-up method, which counts firms, because all we know of the location of firms is the locations of their headquarters, a poor measure of where they create jobs.

U.S. Federal statistical agencies use the North American Industry Classification System (NAICS) to categorize business establishments for the purpose of collecting, analyzing, and publishing data. By detailed review of NAICS definitions, we concluded that 12 of the most recent (2017) codes contain most of the employment in the internet ecosystem.

We then relied on the U.S. Census Bureau’s County Business Patterns (CBP) dataset to determine the counties in which the employees in those NAICS codes worked. The CBP reports the number of employees by NAICS code and county in establishments listed in the Census Bureau’s Business Register, a database of all known single and multi-establishment employer companies. It excludes among others private households with self-employed individuals. For these exclusions we relied on our bottom-up estimates of jobs and distributed them across counties in proportion to the size of the county.



We used the following NAICS codes:

NAICS Code	Description	Number of establishments	Employment
33411	Computer and peripheral equipment manufacturers	875	39,505
334413	Semiconductor and related device manufacturers	809	97,617
4541	Electronic shopping and mail order houses	43465	560,585
5112	Software publishers	14493	690,924
5152	Cable and other subscription programming	970	54,103
517311	Wireless telecommunication carriers	32439	703,105
517410	Satellite telecommunications	402	7,932
518210	Data processing, hosting and related services	17297	552,937
519130	Internet publishing and broadcast and cable portals	8651	295,295
54151	Computer systems design and related services	149632	1,924,248
541810	Advertising agencies	13845	183,958
541830	Media buying agencies	912	21,268
Total			5,131,477

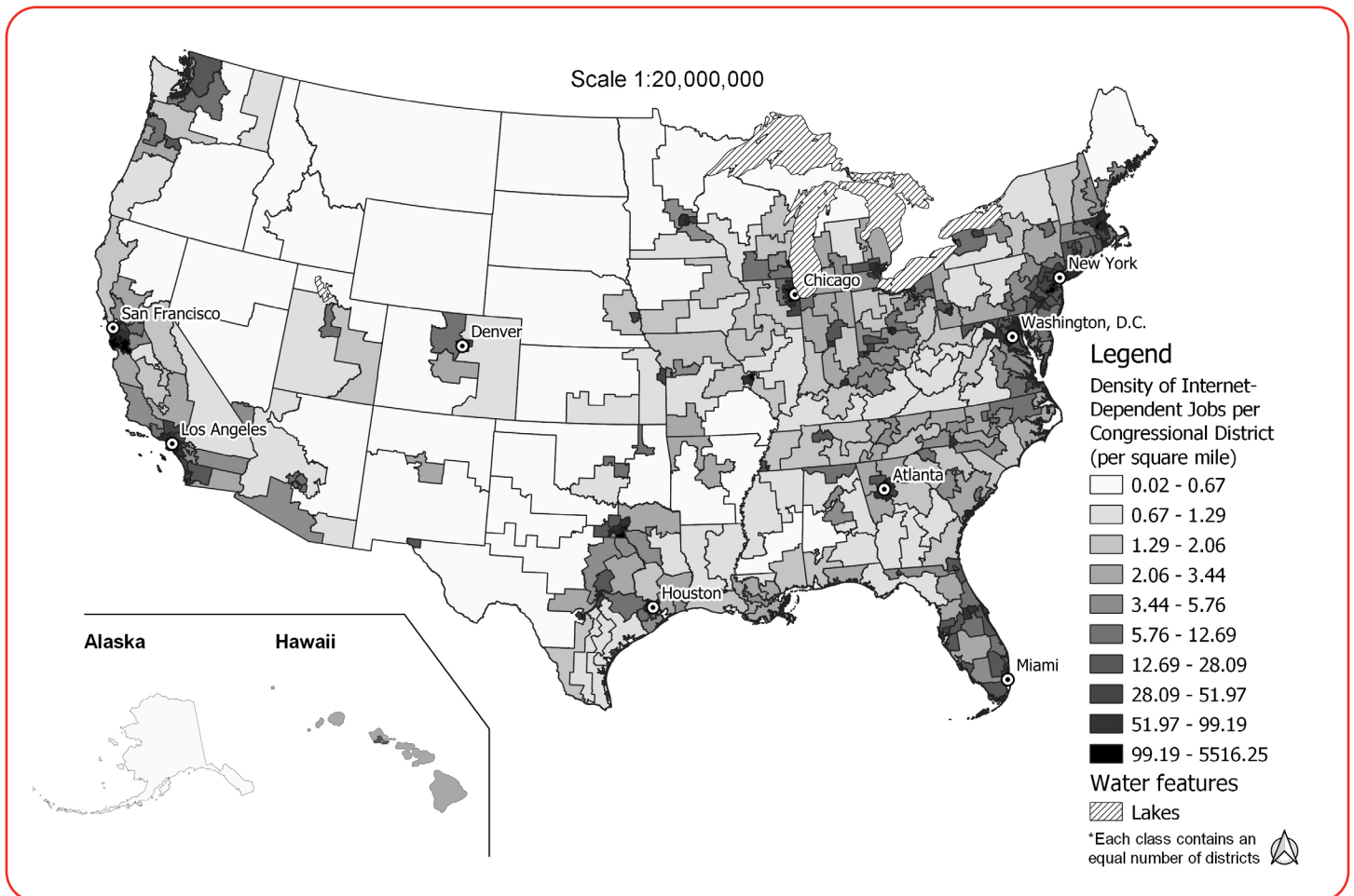


Our top-down estimate of 5.13 million internet-dependent employees is less than our bottom-up estimate of 6.94 million employees. There were two reasons. First, self-employed individuals in private households were not counted. Second, we modeled internet-dependent employment for only the most relevant NAICS industries, those with a meaningful level of internet activity. The CBP enumerates county-level business statistics for over 700 NAICS industries, accounting for tens of millions of employees. Had we examined every 5-digit NAICS code, the proportion of internet-dependent employment to total employment in the codes beyond the big 12 would have fallen rapidly, and the lower the proportion, the less confidence we would have had in our estimates. But across the whole 700 segments, small errors in estimation would have accumulated to become a large error in the final answer. In the bottom-up methodology there are errors too, but the errors are random and therefore self-correcting. In the top-down methodology, the errors increase as the fraction of internet employment in the NAICS sectors decreases and are therefore not self-correcting. We allocated the difference between our bottom-up jobs estimate and the total of our top-down estimate in proportion to county populations.



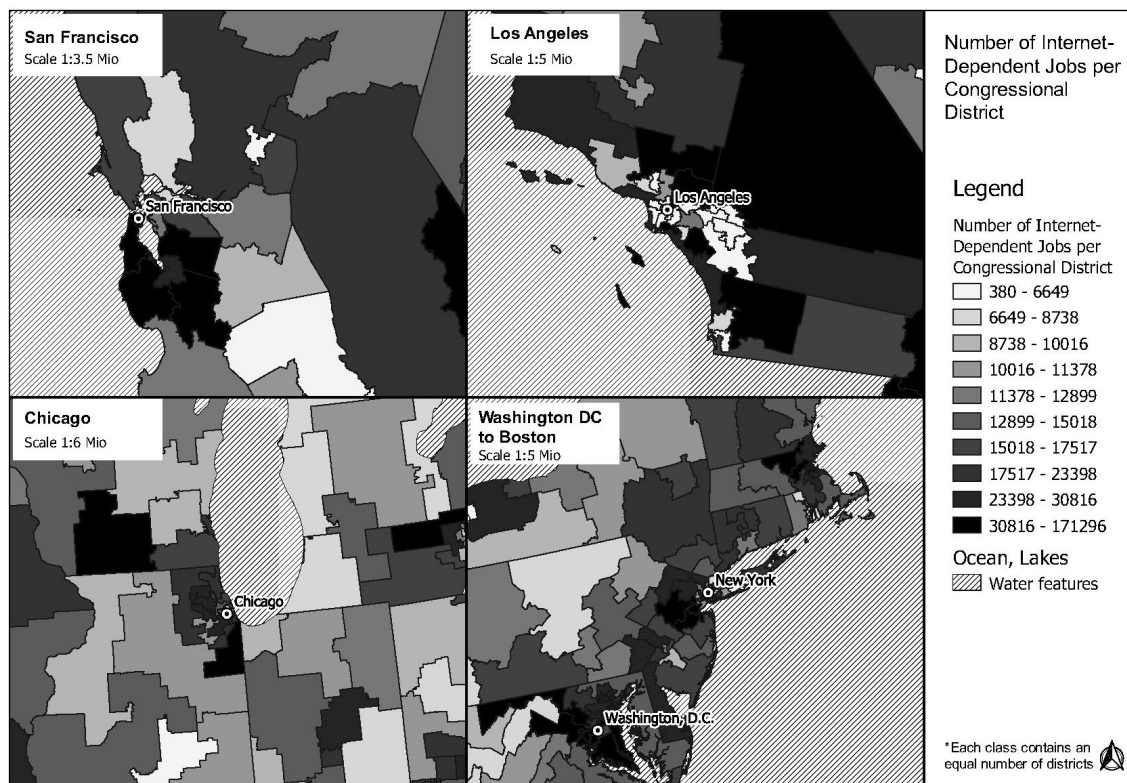
We conclude that the top-down methodology is a reasonable estimate of the lower bound on the size of the internet ecosystem, and a reasonable basis for conservatively allocating employment to U.S. counties. A consultant who maintains a translation table between counties and congressional districts generated the following congressional district maps, plotting districts by Internet jobs per square mile of the congressional district using data from the table to follow.

Density of Internet-Dependent Jobs per Congressional District





In the maps that follow we show four of the areas of heaviest employment.



These maps were generated from the following table. It shows how widely the internet economy is spread across the U.S. Despite the popular impression that Silicon Valley and a few other areas are the home of the internet, the top 10 congressional districts had only 12% of the jobs and 25% of the jobs were spread across the lighter 50% of congressional districts. No district had fewer than 347 jobs dependent on the internet, because infrastructure workers were widely dispersed and so were people selling or creating on the internet.



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Alabama	CD 1	717,438	10,352	1.44%	1.91
Alabama	CD 2	674,920	8,765	1.30%	0.97
Alabama	CD 3	717,896	7,932	1.10%	1.18
Alabama	CD 4	687,453	8,132	1.18%	1.03
Alabama	CD 5	735,858	21,532	2.93%	6.56
Alabama	CD 6	699,605	14,824	2.12%	3.98
Alabama	CD 7	670,015	5,906	0.88%	0.65
Alaska	CD (at Large)	731,545	11,855	1.62%	0.02
Arizona	CD 1	782,088	9,020	1.15%	0.18
Arizona	CD 2	733,197	6,048	0.82%	0.86
Arizona	CD 3	801,531	62,534	7.80%	4.47
Arizona	CD 4	825,763	38,008	4.60%	1.28
Arizona	CD 5	849,917	3,249	0.38%	12.40
Arizona	CD 6	814,971	6,969	0.86%	12.50
Arizona	CD 7	853,856	2,268	0.27%	12.42
Arizona	CD 8	798,544	5,998	0.75%	12.44
Arizona	CD 9	818,850	1,832	0.22%	12.46
Arkansas	CD 1	719,048	7,479	1.04%	0.43
Arkansas	CD 2	767,662	14,482	1.89%	3.26
Arkansas	CD 3	829,149	11,531	1.39%	2.39
Arkansas	CD 4	701,945	7,682	1.09%	0.39
California	CD 1	711,905	10,276	1.44%	0.41
California	CD 2	708,434	15,552	2.20%	1.35
California	CD 3	755,811	16,655	2.20%	3.02
California	CD 4	757,806	17,715	2.34%	1.55
California	CD 5	726,072	6,173	0.85%	4.00
California	CD 6	781,943	4,130	0.53%	26.44
California	CD 7	756,668	14,344	1.90%	29.28



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
California	CD 8	723,311	31,531	4.36%	1.07
California	CD 9	784,956	11,059	1.41%	9.91
California	CD 10	764,859	7,956	1.04%	4.90
California	CD 11	765,504	13,738	1.79%	31.43
California	CD 12	779,824	60,717	7.79%	1,744.89
California	CD 13	768,889	10,524	1.37%	121.82
California	CD 14	742,980	105,394	14.19%	454.70
California	CD 15	782,312	43,792	5.60%	82.04
California	CD 16	753,152	3,162	0.42%	1.25
California	CD 17	790,519	25,101	3.18%	151.71
California	CD 18	753,806	70,671	9.38%	113.77
California	CD 19	737,535	152,870	20.73%	187.03
California	CD 20	741,838	11,353	1.53%	2.61
California	CD 21	729,460	9,671	1.33%	1.61
California	CD 22	768,917	1,441	0.19%	1.39
California	CD 23	741,557	20,498	2.76%	2.32
California	CD 24	737,443	23,768	3.22%	3.87
California	CD 25	718,949	75,958	10.57%	50.34
California	CD 26	725,535	8,738	1.20%	10.43
California	CD 27	712,783	31,610	4.43%	50.61
California	CD 28	693,299	10,013	1.44%	51.36
California	CD 29	717,659	4,230	0.59%	51.37
California	CD 30	764,062	6,017	0.79%	49.59
California	CD 31	753,576	347	0.05%	1.77
California	CD 32	700,726	5,754	0.82%	51.89
California	CD 33	703,908	21,734	3.09%	84.37
California	CD 34	730,042	2,185	0.30%	51.36
California	CD 35	764,643	1,275	0.17%	8.46



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
California	CD 36	755,764	24,624	3.26%	4.66
California	CD 37	733,668	2,522	0.34%	51.13
California	CD 38	704,515	4,756	0.68%	52.55
California	CD 39	717,176	11,505	1.60%	62.82
California	CD 40	715,934	2,655	0.37%	51.57
California	CD 41	786,719	1,311	0.17%	4.64
California	CD 42	840,562	3,915	0.47%	4.69
California	CD 43	748,092	3,285	0.44%	51.06
California	CD 44	717,140	4,777	0.67%	67.42
California	CD 45	791,311	29,255	3.70%	99.16
California	CD 46	734,651	6,395	0.87%	99.20
California	CD 47	717,594	31,794	4.43%	164.73
California	CD 48	718,359	22,392	3.12%	171.92
California	CD 49	731,366	25,538	3.49%	51.70
California	CD 50	758,142	55,804	7.36%	22.42
California	CD 51	740,797	14,549	1.96%	3.40
California	CD 52	767,151	7,662	1.00%	32.14
California	CD 53	782,599	2,769	0.35%	22.80
Colorado	CD 1	852,816	28,864	3.38%	170.39
Colorado	CD 2	824,050	39,187	4.76%	5.83
Colorado	CD 3	756,569	8,986	1.19%	0.20
Colorado	CD 4	868,302	42,687	4.92%	1.26
Colorado	CD 5	820,255	21,796	2.66%	3.36
Colorado	CD 6	828,201	9,014	1.09%	21.31
Colorado	CD 7	808,543	3,869	0.48%	12.81
Connecticut	CD 1	703,138	16,789	2.39%	27.85
Connecticut	CD 2	701,590	14,542	2.07%	8.20
Connecticut	CD 3	717,989	10,426	1.45%	24.84



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Connecticut	CD 4	737,733	19,690	2.67%	47.87
Connecticut	CD 5	704,837	18,267	2.59%	16.40
Delaware	CD (at Large)	973,764	21,761	2.23%	12.51
District of Columbia	Delegate District (at Large)	705,749	35,255	5.00%	646.19
Florida	CD 1	798,305	11,688	1.46%	3.26
Florida	CD 2	720,777	9,654	1.34%	0.98
Florida	CD 3	758,939	9,908	1.31%	3.11
Florida	CD 4	836,235	18,024	2.16%	12.87
Florida	CD 5	742,643	11,892	1.60%	3.49
Florida	CD 6	790,455	12,410	1.57%	6.40
Florida	CD 7	814,980	18,594	2.28%	53.06
Florida	CD 8	780,036	21,754	2.79%	13.92
Florida	CD 9	931,872	13,037	1.40%	6.32
Florida	CD 10	811,634	21,102	2.60%	54.28
Florida	CD 11	813,112	7,339	0.90%	3.42
Florida	CD 12	811,308	12,714	1.57%	16.60
Florida	CD 13	731,658	15,624	2.14%	96.32
Florida	CD 14	831,508	11,047	1.33%	44.86
Florida	CD 15	801,294	14,477	1.81%	14.92
Florida	CD 16	873,875	21,465	2.46%	18.56
Florida	CD 17	804,754	11,140	1.38%	2.24
Florida	CD 18	795,742	10,035	1.26%	7.45
Florida	CD 19	833,013	10,266	1.23%	15.39
Florida	CD 20	802,463	44,102	5.50%	22.89
Florida	CD 21	786,566	3,550	0.45%	15.54
Florida	CD 22	760,953	7,009	0.92%	47.96



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Florida	CD 23	762,858	7,824	1.03%	46.93
Florida	CD 24	754,731	2,143	0.28%	23.44
Florida	CD 25	796,422	12,690	1.59%	4.06
Florida	CD 26	780,951	24,862	3.18%	12.75
Florida	CD 27	750,653	5,772	0.77%	57.12
Georgia	CD 1	749,949	10,822	1.44%	1.49
Georgia	CD 2	671,831	8,666	1.29%	1.01
Georgia	CD 3	750,998	8,679	1.16%	2.54
Georgia	CD 4	782,142	19,910	2.55%	44.87
Georgia	CD 5	788,996	27,537	3.49%	116.45
Georgia	CD 6	742,932	34,309	4.62%	128.60
Georgia	CD 7	844,773	19,690	2.33%	56.17
Georgia	CD 8	706,237	7,724	1.09%	0.99
Georgia	CD 9	771,168	10,242	1.33%	2.20
Georgia	CD 10	757,807	12,350	1.63%	1.95
Georgia	CD 11	782,704	19,567	2.50%	20.49
Georgia	CD 12	732,810	7,945	1.08%	1.08
Georgia	CD 13	802,943	37,612	4.68%	59.00
Georgia	CD 14	732,133	7,128	0.97%	2.20
Hawaii	CD 1	720,786	2,425	0.34%	13.00
Hawaii	CD 2	695,086	16,139	2.32%	2.91
Idaho	CD 1	934,826	19,623	2.10%	0.56
Idaho	CD 2	852,239	10,492	1.23%	0.27
Illinois	CD 1	711,039	17,398	2.45%	75.45
Illinois	CD 2	685,695	29,332	4.28%	30.42
Illinois	CD 3	702,503	24,911	3.55%	117.85
Illinois	CD 4	676,674	7,614	1.13%	162.72
Illinois	CD 5	739,401	12,942	1.75%	151.71



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Illinois	CD 6	710,626	25,500	3.59%	75.45
Illinois	CD 7	727,761	9,285	1.28%	166.89
Illinois	CD 8	717,115	23,449	3.27%	127.76
Illinois	CD 9	719,256	15,327	2.13%	162.94
Illinois	CD 10	706,189	16,066	2.27%	59.99
Illinois	CD 11	721,594	9,648	1.34%	38.57
Illinois	CD 12	679,002	8,346	1.23%	1.87
Illinois	CD 13	698,830	5,612	0.80%	1.09
Illinois	CD 14	727,525	17,661	2.43%	12.39
Illinois	CD 15	685,859	9,721	1.42%	0.74
Illinois	CD 16	694,262	10,001	1.44%	1.42
Illinois	CD 17	666,201	7,982	1.20%	1.29
Illinois	CD 18	702,289	12,160	1.73%	1.30
Indiana	CD 1	719,122	8,198	1.14%	7.94
Indiana	CD 2	721,469	10,133	1.40%	2.87
Indiana	CD 3	753,051	11,401	1.51%	3.06
Indiana	CD 4	767,105	12,641	1.65%	2.23
Indiana	CD 5	791,257	23,493	2.97%	13.68
Indiana	CD 6	720,190	7,770	1.08%	1.40
Indiana	CD 7	777,205	18,943	2.44%	69.81
Indiana	CD 8	716,924	8,894	1.24%	1.37
Indiana	CD 9	765,896	12,487	1.63%	3.12
Iowa	CD 1	774,014	16,944	2.19%	1.58
Iowa	CD 2	782,989	11,634	1.49%	1.06
Iowa	CD 3	848,170	15,385	1.81%	1.96
Iowa	CD 4	749,897	9,256	1.23%	0.46
Kansas	CD 1	694,498	9,283	1.34%	0.20
Kansas	CD 2	715,881	10,276	1.44%	0.81



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Kansas	CD 3	779,860	22,715	2.91%	33.60
Kansas	CD 4	723,075	10,606	1.47%	0.83
Kentucky	CD 1	717,704	9,184	1.28%	0.85
Kentucky	CD 2	774,897	12,062	1.56%	1.88
Kentucky	CD 3	742,543	15,359	2.07%	53.84
Kentucky	CD 4	761,936	15,213	2.00%	3.90
Kentucky	CD 5	689,793	9,604	1.39%	0.96
Kentucky	CD 6	780,800	15,598	2.00%	4.07
Louisiana	CD 1	799,917	12,383	1.55%	3.44
Louisiana	CD 2	788,021	5,901	0.75%	5.21
Louisiana	CD 3	785,101	9,226	1.18%	1.48
Louisiana	CD 4	737,674	7,800	1.06%	0.70
Louisiana	CD 5	734,377	9,576	1.30%	0.74
Louisiana	CD 6	803,704	11,531	1.43%	3.20
Maine	CD 1	686,731	12,618	1.84%	4.30
Maine	CD 2	657,481	8,753	1.33%	0.36
Maryland	CD 1	737,341	12,892	1.75%	3.63
Maryland	CD 2	750,702	15,710	2.09%	50.49
Maryland	CD 3	779,502	23,978	3.08%	88.24
Maryland	CD 4	758,795	13,757	1.81%	51.76
Maryland	CD 5	756,743	29,506	3.90%	22.30
Maryland	CD 6	769,046	27,962	3.64%	16.05
Maryland	CD 7	717,158	26,522	3.70%	60.87
Maryland	CD 8	776,393	18,273	2.35%	23.82
Massachusetts	CD 1	723,831	11,530	1.59%	5.50
Massachusetts	CD 2	759,750	13,084	1.72%	9.01
Massachusetts	CD 3	771,723	51,757	6.71%	76.55
Massachusetts	CD 4	765,466	18,915	2.47%	31.71



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Massachusetts	CD 5	768,043	35,546	4.63%	150.23
Massachusetts	CD 6	770,998	25,730	3.34%	54.72
Massachusetts	CD 7	819,035	27,542	3.36%	492.10
Massachusetts	CD 8	765,516	20,883	2.73%	71.78
Massachusetts	CD 9	748,141	12,233	1.64%	11.27
Michigan	CD 1	697,102	7,652	1.10%	0.34
Michigan	CD 2	746,998	7,426	0.99%	2.49
Michigan	CD 3	752,287	12,946	1.72%	5.51
Michigan	CD 4	702,887	8,939	1.27%	1.18
Michigan	CD 5	672,466	7,122	1.06%	3.40
Michigan	CD 6	721,508	7,794	1.08%	2.46
Michigan	CD 7	710,064	15,345	2.16%	4.07
Michigan	CD 8	740,750	27,659	3.73%	20.62
Michigan	CD 9	718,223	6,007	0.84%	36.66
Michigan	CD 10	721,753	12,281	1.70%	3.32
Michigan	CD 11	735,677	21,070	2.86%	56.34
Michigan	CD 12	704,912	13,755	1.95%	38.26
Michigan	CD 13	672,291	7,851	1.17%	47.57
Michigan	CD 14	689,939	10,254	1.49%	61.98
Minnesota	CD 1	679,003	10,878	1.60%	1.02
Minnesota	CD 2	717,698	11,834	1.65%	5.44
Minnesota	CD 3	730,214	41,019	5.62%	87.19
Minnesota	CD 4	719,873	13,092	1.82%	44.11
Minnesota	CD 5	724,373	10,739	1.48%	88.66
Minnesota	CD 6	729,029	10,371	1.42%	4.03
Minnesota	CD 7	668,096	8,324	1.25%	0.28
Minnesota	CD 8	671,346	7,695	1.15%	0.31
Mississippi	CD 1	769,026	7,637	0.99%	0.81



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Mississippi	CD 2	692,452	10,492	1.52%	0.76
Mississippi	CD 3	738,992	7,534	1.02%	0.66
Mississippi	CD 4	775,679	9,602	1.24%	1.34
Missouri	CD 1	727,772	21,689	2.98%	108.05
Missouri	CD 2	751,926	24,124	3.21%	58.04
Missouri	CD 3	802,919	10,684	1.33%	1.75
Missouri	CD 4	775,664	9,399	1.21%	0.73
Missouri	CD 5	777,659	12,291	1.58%	5.68
Missouri	CD 6	777,104	25,834	3.32%	1.59
Missouri	CD 7	787,917	11,568	1.47%	2.07
Missouri	CD 8	736,467	8,456	1.15%	0.48
Montana	CD (at Large)	1,068,778	14,756	1.38%	0.11
Nebraska	CD 1	651,958	11,145	1.71%	1.41
Nebraska	CD 2	684,882	18,650	2.72%	41.22
Nebraska	CD 3	597,568	6,451	1.08%	0.11
Nevada	CD 1	712,411	406	0.06%	4.35
Nevada	CD 2	736,907	11,652	1.58%	0.23
Nevada	CD 3	857,197	11,161	1.30%	4.39
Nevada	CD 4	773,641	20,620	2.67%	0.45
New Hampshire	CD 1	686,735	12,512	1.82%	5.69
New Hampshire	CD 2	672,976	18,452	2.74%	3.19
New Jersey	CD 1	726,825	8,854	1.22%	28.33
New Jersey	CD 2	707,255	14,080	1.99%	7.53
New Jersey	CD 3	735,981	13,337	1.81%	16.64
New Jersey	CD 4	748,199	14,809	1.98%	24.01
New Jersey	CD 5	734,764	25,477	3.47%	28.79
New Jersey	CD 6	739,726	28,688	3.88%	149.32
New Jersey	CD 7	734,239	33,207	4.52%	38.36



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
New Jersey	CD 8	766,357	14,474	1.89%	296.84
New Jersey	CD 9	762,322	10,424	1.37%	122.55
New Jersey	CD 10	761,783	9,264	1.22%	136.89
New Jersey	CD 11	717,657	23,171	3.23%	51.29
New Jersey	CD 12	747,082	46,003	6.16%	125.08
New Mexico	CD 1	691,229	8,936	1.29%	2.18
New Mexico	CD 2	705,615	9,291	1.32%	0.15
New Mexico	CD 3	699,985	7,170	1.02%	0.18
New York	CD 1	713,168	20,880	2.93%	35.98
New York	CD 2	698,974	5,873	0.84%	36.25
New York	CD 3	725,746	14,605	2.01%	64.19
New York	CD 4	730,314	9,515	1.30%	96.29
New York	CD 5	759,001	15,833	2.09%	341.49
New York	CD 6	714,299	4,277	0.60%	160.85
New York	CD 7	698,794	14,300	2.05%	992.81
New York	CD 8	776,825	15,857	2.04%	625.28
New York	CD 9	720,316	5,571	0.77%	401.49
New York	CD 10	732,732	62,900	8.58%	5,016.21
New York	CD 11	737,390	9,957	1.35%	171.83
New York	CD 12	725,760	47,615	6.56%	3,606.87
New York	CD 13	751,661	50,021	6.65%	5,516.25
New York	CD 14	696,664	9,257	1.33%	364.29
New York	CD 15	739,390	4,414	0.60%	340.72
New York	CD 16	739,893	6,047	0.82%	86.46
New York	CD 17	737,355	12,612	1.71%	36.94
New York	CD 18	718,624	13,660	1.90%	11.30
New York	CD 19	701,011	16,313	2.33%	2.30
New York	CD 20	725,669	13,419	1.85%	12.21



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
New York	CD 21	694,835	9,997	1.44%	0.74
New York	CD 22	688,391	9,000	1.31%	1.99
New York	CD 23	687,583	8,436	1.23%	1.28
New York	CD 24	701,841	11,121	1.58%	5.22
New York	CD 25	714,657	15,580	2.18%	34.23
New York	CD 26	703,114	2,961	0.42%	15.14
New York	CD 27	719,554	21,702	3.02%	6.12
North Carolina	CD 1	763,500	54,644	7.16%	10.43
North Carolina	CD 2	888,547	9,080	1.02%	3.77
North Carolina	CD 3	761,753	16,842	2.21%	2.61
North Carolina	CD 4	873,270	7,485	0.86%	11.45
North Carolina	CD 5	765,013	9,380	1.23%	2.65
North Carolina	CD 6	791,470	8,285	1.05%	2.37
North Carolina	CD 7	816,402	9,796	1.20%	1.85
North Carolina	CD 8	815,055	7,876	0.97%	2.99
North Carolina	CD 9	796,413	13,913	1.75%	4.02
North Carolina	CD 10	771,791	7,966	1.03%	3.45
North Carolina	CD 11	772,612	7,961	1.03%	1.35
North Carolina	CD 12	891,792	27,199	3.05%	72.57
North Carolina	CD 13	780,466	6,307	0.81%	3.86
North Dakota	CD (at Large)	762,062	12,212	1.60%	0.20
Ohio	CD 1	749,773	18,729	2.50%	30.57
Ohio	CD 2	730,151	12,902	1.77%	4.49
Ohio	CD 3	813,890	14,388	1.77%	70.69
Ohio	CD 4	712,261	6,705	0.94%	1.61
Ohio	CD 5	721,212	8,621	1.20%	1.72
Ohio	CD 6	698,284	8,678	1.24%	1.35
Ohio	CD 7	727,011	9,414	1.29%	2.73



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Ohio	CD 8	733,811	9,545	1.30%	4.37
Ohio	CD 9	697,570	14,319	2.05%	34.65
Ohio	CD 10	723,716	19,133	2.64%	18.98
Ohio	CD 11	684,617	17,590	2.57%	80.60
Ohio	CD 12	788,335	13,912	1.76%	6.86
Ohio	CD 13	704,191	7,221	1.03%	9.05
Ohio	CD 14	714,870	12,441	1.74%	7.13
Ohio	CD 15	769,664	20,911	2.72%	4.94
Ohio	CD 16	719,744	9,891	1.37%	9.19
Oklahoma	CD 1	809,500	16,785	2.07%	11.53
Oklahoma	CD 2	747,337	7,659	1.02%	0.41
Oklahoma	CD 3	782,091	8,052	1.03%	0.26
Oklahoma	CD 4	792,928	8,907	1.12%	1.02
Oklahoma	CD 5	825,115	14,761	1.79%	7.97
Oregon	CD 1	858,875	29,947	3.49%	11.16
Oregon	CD 2	841,022	10,176	1.21%	0.16
Oregon	CD 3	853,116	20,865	2.45%	21.76
Oregon	CD 4	820,504	11,222	1.37%	0.73
Oregon	CD 5	844,220	10,281	1.22%	2.22
Pennsylvania	CD 1	713,411	14,550	2.04%	25.54
Pennsylvania	CD 2	722,722	13,770	1.91%	245.81
Pennsylvania	CD 3	741,654	11,377	1.53%	241.60
Pennsylvania	CD 4	730,701	24,936	3.41%	58.59
Pennsylvania	CD 5	719,973	16,985	2.36%	89.87
Pennsylvania	CD 6	735,283	22,125	3.01%	27.16
Pennsylvania	CD 7	731,467	13,542	1.85%	17.71
Pennsylvania	CD 8	698,973	9,286	1.33%	3.90
Pennsylvania	CD 9	699,832	12,547	1.79%	4.27



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Pennsylvania	CD 10	744,681	11,264	1.51%	11.68
Pennsylvania	CD 11	734,038	11,293	1.54%	8.42
Pennsylvania	CD 12	701,387	7,604	1.08%	0.86
Pennsylvania	CD 13	697,051	13,545	1.94%	2.52
Pennsylvania	CD 14	678,915	7,778	1.15%	3.06
Pennsylvania	CD 15	672,749	10,870	1.62%	1.25
Pennsylvania	CD 16	678,333	8,525	1.26%	2.88
Pennsylvania	CD 17	706,961	22,117	3.13%	28.07
Pennsylvania	CD 18	693,858	13,815	1.99%	52.91
Rhode Island	CD 1	530,066	6,336	1.20%	26.43
Rhode Island	CD 2	529,295	11,273	2.13%	16.50
South Carolina	CD 1	821,107	10,563	1.29%	7.64
South Carolina	CD 2	722,542	12,415	1.72%	4.60
South Carolina	CD 3	706,961	8,582	1.21%	1.83
South Carolina	CD 4	754,148	11,797	1.56%	10.18
South Carolina	CD 5	738,205	8,632	1.17%	1.76
South Carolina	CD 6	665,215	16,191	2.43%	2.25
South Carolina	CD 7	740,536	7,934	1.07%	1.66
South Dakota	CD (at Large)	884,659	11,322	1.28%	0.17
Tennessee	CD 1	725,173	7,961	1.10%	2.15
Tennessee	CD 2	758,519	10,575	1.39%	5.10
Tennessee	CD 3	743,225	12,155	1.64%	2.98
Tennessee	CD 4	812,697	10,537	1.30%	1.97
Tennessee	CD 5	778,094	18,852	2.42%	16.93
Tennessee	CD 6	799,365	7,814	0.98%	1.35
Tennessee	CD 7	800,536	13,494	1.69%	1.65
Tennessee	CD 8	711,068	10,149	1.43%	1.66
Tennessee	CD 9	700,497	9,647	1.38%	22.35



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Texas	CD 1	726,094	8,642	1.19%	1.23
Texas	CD 2	787,271	15,217	1.93%	55.17
Texas	CD 3	913,161	26,063	2.85%	60.73
Texas	CD 4	782,743	24,796	3.17%	2.74
Texas	CD 5	759,749	22,136	2.91%	4.92
Texas	CD 6	818,442	9,890	1.21%	5.16
Texas	CD 7	762,826	7,517	0.99%	51.96
Texas	CD 8	895,861	10,177	1.14%	1.88
Texas	CD 9	769,335	6,038	0.78%	40.81
Texas	CD 10	925,348	32,253	3.49%	7.13
Texas	CD 11	790,264	7,288	0.92%	0.29
Texas	CD 12	844,563	16,373	1.94%	12.73
Texas	CD 13	714,733	7,794	1.09%	0.23
Texas	CD 14	760,530	9,057	1.19%	4.15
Texas	CD 15	804,562	8,023	1.00%	1.15
Texas	CD 16	747,648	9,912	1.33%	15.62
Texas	CD 17	786,023	14,119	1.80%	2.07
Texas	CD 18	827,015	10,922	1.32%	51.97
Texas	CD 19	729,664	8,477	1.16%	0.37
Texas	CD 20	832,518	5,708	0.69%	32.00
Texas	CD 21	829,628	13,860	1.67%	2.62
Texas	CD 22	960,957	10,616	1.10%	11.51
Texas	CD 23	786,712	23,052	2.93%	0.44
Texas	CD 24	832,445	20,586	2.47%	87.78
Texas	CD 25	818,807	36,760	4.49%	5.40
Texas	CD 26	920,865	11,519	1.25%	14.21
Texas	CD 27	745,526	7,455	1.00%	0.92
Texas	CD 28	772,410	12,633	1.64%	1.51



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Texas	CD 29	783,915	8,795	1.12%	52.67
Texas	CD 30	792,445	48,048	6.06%	150.97
Texas	CD 31	916,064	25,982	2.84%	13.51
Texas	CD 32	778,087	23,751	3.05%	143.04
Texas	CD 33	751,182	17,916	2.38%	94.69
Texas	CD 34	712,596	7,200	1.01%	0.98
Texas	CD 35	857,654	18,612	2.17%	35.10
Texas	CD 36	758,238	18,874	2.49%	2.97
Utah	CD 1	787,582	9,055	1.15%	0.52
Utah	CD 2	788,484	25,502	3.23%	0.71
Utah	CD 3	779,460	27,418	3.52%	1.53
Utah	CD 4	850,432	24,584	2.89%	10.80
Vermont	CD (at Large)	623,989	15,492	2.48%	1.88
Virginia	CD 1	824,492	13,191	1.60%	3.51
Virginia	CD 2	723,927	14,766	2.04%	14.99
Virginia	CD 3	760,127	8,840	1.16%	15.84
Virginia	CD 4	768,382	22,012	2.86%	6.77
Virginia	CD 5	735,766	10,607	1.44%	1.18
Virginia	CD 6	755,012	10,114	1.34%	1.91
Virginia	CD 7	802,921	13,202	1.64%	4.74
Virginia	CD 8	813,568	66,315	8.15%	497.39
Virginia	CD 9	704,078	9,191	1.31%	1.13
Virginia	CD 10	857,693	84,744	9.88%	69.24
Virginia	CD 11	789,553	48,953	6.20%	296.39
Washington	CD 1	791,545	77,125	9.74%	13.97
Washington	CD 2	760,064	3,314	0.44%	3.66
Washington	CD 3	756,675	14,150	1.87%	1.74
Washington	CD 4	735,797	8,288	1.13%	0.48



State	Congressional District (CD)	CD Population	Internet Jobs	Internet Jobs Relative to the CD's Population	Internet Jobs per Square Mile of the CD
Washington	CD 5	734,322	11,094	1.51%	0.80
Washington	CD 6	726,540	7,424	1.02%	1.21
Washington	CD 7	817,787	17,091	2.09%	133.01
Washington	CD 8	770,177	71,524	9.29%	10.89
Washington	CD 9	751,595	13,837	1.84%	84.45
Washington	CD 10	770,391	5,856	0.76%	7.93
West Virginia	CD 1	601,811	7,880	1.31%	1.41
West Virginia	CD 2	623,039	7,477	1.20%	1.04
West Virginia	CD 3	567,297	6,736	1.19%	0.77
Wisconsin	CD 1	721,691	15,327	2.12%	9.94
Wisconsin	CD 2	773,663	28,380	3.67%	7.01
Wisconsin	CD 3	723,169	11,904	1.65%	1.20
Wisconsin	CD 4	704,146	17,776	2.52%	155.11
Wisconsin	CD 5	733,314	8,906	1.21%	5.28
Wisconsin	CD 6	715,828	8,771	1.23%	2.00
Wisconsin	CD 7	714,544	9,134	1.28%	0.44
Wisconsin	CD 8	736,079	10,180	1.38%	1.68
Wyoming	CD (at Large)	578,759	7,325	1.27%	0.08
Total			6,941,387		



About the authors

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John Deighton is the Harold M. Brierley Professor of Business Administration Emeritus at Harvard Business School. His recent published research includes “The Socioeconomic Impact of Internet Tracking,” IAB, 2020, “Rethinking the Profession Formerly Known as Advertising: How Data Science Is Disrupting the Work of Agencies,” *Journal of Advertising Research*, 2018, “Big Data,” *Consumption, Markets and Culture*, 2018. Recent case studies include Wattpad, Gimlet Media, DataXu, Oracle, Acxiom, Instacart, Managing Data at Allstate, WPP: From Mad Men to Math Men, and Target Stores: The Hunt for Unvolunteered Truths. His Twitter feed is @HBSmktg.

He is a past editor of the *Journal of Consumer Research* and founding editor of the *Journal of Interactive Marketing*. He has served as the Executive Director of the Marketing Science Institute, and as Director of the Berkman-Klein Center for Internet and Society at Harvard University. He has held visiting professor positions at Duke University, the University of Tokyo, Oxford and Cambridge Universities, and teaches courses on technology and marketing at Cornell Tech and the University of Cape Town.

Leora Kornfeld

Leora Kornfeld is a media and technology researcher, writer, and consultant working with public and private sector organizations in the U.S. and Canada and for three seasons has been the host of *Now & Next*, a top-rated podcast on the Apple Podcasts Canada charts. In addition to custom research for organizations such as the Canada Media Fund, Destination Canada (formerly the Canadian Tourism Commission), and the Public Policy Forum, she has served as senior researcher and co-author on a series of studies that examine the economic value of the Internet ecosystem, as well as co-authoring over two dozen Harvard Business School cases on emerging technologies and digital business models. She holds an M.A. in Media & Communications from the University of London, Goldsmiths College.



Endnotes

¹ The 2008 study used 2008 data. The 2012 study used data from the second half of 2011 and the first two quarters of 2012. The 2016 study used data from the third quarter of 2015 and the first three quarters of 2016.

² Robert Cannon (2004) "Will the Real Internet Please Stand Up: An Attorney's Quest to Define the Internet," Telecommunications Policy Research Conference 2002, Posted: 15 Mar 2004

³ Source: <https://www.wired.com/story/wikipedia-finally-asking-big-tech-to-pay-up/>

⁴ We exclude websites and apps giving access to pirated entertainment <https://www.bnnbloomberg.ca/pirated-entertainment-sites-are-making-billions-from-ads-1.1639377>, the deep web and dark web, and adult content. <https://www.theguardian.com/commentisfree/2018/dec/30/internet-porn-says-more-about-ourselves-than-technology>

⁵ Boulding, K. (1978). *Ecodynamics: A New Theory of Societal Evolution*. Beverly Hills, CA. Sage.

⁶ Moore, James F. (1996). *The Death of Competition: Leadership & Strategy in the Age of Business Ecosystems*. New York: Harper Business.

⁷ Mars, M., Bronstein, J. and Lusch, R. (forthcoming). The value of a metaphor: Organizations and ecosystems. *Organizational Dynamics*.

⁸ Iansiti, Marco and Levien, Roy (2004). *The Keystone Advantage: What the new Dynamics of Business Ecosystems Mean for Strategy, Innovation and Sustainability*. Harvard Business School Press.

⁹ Greenstein, Shane (2015). *How the Internet Became Commercial*. University Press: Princeton, NJ.

¹⁰ Source: <https://www.emarketer.com/content/why-dsps-are-applying-ai-to-programmatic-bidding>

¹¹ Source: <https://www.emarketer.com/content/ad-supported-video-viewership-on-rise-opportunities-marketers>

¹² Bivens, Josh (2003) Updated Employment Multipliers for the U.S. Economy, EPI Working Paper 268. Economic Policy Institute.

¹³ T-Mobile Website: "T-Mobile Completes Merger with Sprint to Create the New T-Mobile," April 01, 2020.

¹⁴ No direct estimate is possible from the 2020 Form 10-K filing, but we make this estimate from pre-merger filings for Sprint and T-Mobile.

¹⁵ Source: <https://www.telecompetitor.com/centurylink-rebrands-as-lumen-sort-of/>

¹⁶ Source: <https://www.zippia.com/zayo-group-careers-13078/> and 2019 Form 10-K.

¹⁷ December 31, 2019 Annual Report.

¹⁸ December 31, 2019 10-K.

¹⁹ By subtraction from the list at <https://asrank.caida.org/>.

²⁰ By subtraction from <https://asrank.caida.org/>.

²¹ Source: <https://www.fiercewireless.com/wireless/zte-s-fanfare-lands-at-t-s-cricket-for-under-70-c-spire-up-and-running-netcracker-s>



Endnotes (cont'd)

²² See most recent Form 10-K.

²³ See most recent Form 10-K.

²⁴ See most recent Form 10-K.

²⁵ Current Form 10-K.

²⁶ Source: <https://timesofsandiego.com/business/2018/04/19/qualcomm-to-lay-off-1231-employees-across-san-diego-county/>

²⁷ Source: <https://www.qualcomm.com/company/facilities/offices?country=USA>

²⁸ From Ericsson's 2020 annual report at: <https://www.ericsson.com/494193/assets/local/investors/documents/2020/annual-report-2020-en.pdf> Net sales of \$232.4 billion SEK, converted to \$26.7 billion U.S. on July 21, 2021. The North American segment is 32% of 2020 sales. Therefore 32% of \$26.7 billion totals \$8.5 billion, of which we take 90% as U.S.-based to arrive at our estimate of \$7.65 billion for 2020 U.S. revenue. The company has a global employment of approximately 100,000 in 180 countries. Employment is not broken down by geographical territory, therefore we use the productivity per employee of competitor Dell which is \$375,000 and applied it to Ericsson's U.S. revenue to arrive at our U.S. employment estimate of 20,400.

²⁹ Via 2020 Form 10-K at: <https://ir.commscope.com/static-files/e3887adf-f5e8-4ed5-9765-ddeebe8e3521020> Net sales: U.S. is \$5.185 billion of global sales of \$8.436 billion (U.S. is 61.5% of global). U.S. employment reported as 6,000.

³⁰ Via 2020 Form 10-K at: https://s25.q4cdn.com/632471818/files/doc_financials/2020/annual_report/FY2020-10K.pdf 2020 Net sales: \$3.34 billion of which U.S. is \$1.96 billion or 59%. U.S. employment: We take 70% of the 2,090 full time, part time, and seasonal and temporary worker number reported in the 10-K to arrive at our estimate of 1,463.

³¹ Via 2020 Form 10-K at: <https://investors.avaya.com/financial-info/sec-filings/sec-filings-details/default.aspx?FilingId=14527320> . 2020 Revenue: U.S. is \$1.64B of \$2.87B, or 57%. Employment: 8,266 across 88 locations in 45 countries and 15 U.S. locations, therefore we estimate one third are U.S. employees or 2,728.

³² Via S-1 filing at: <https://www.sec.gov/Archives/edgar/data/1835591/000119312521062802/d87723ds1.htm>: 527 U.S. employees are reported and we assume 90% of \$2.02 billion, or \$1,834 billion is in the U.S.

³³ Via Form 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001428439/a80a3256-5d65-4070-92b1-cbf422b85d7e.pdf> The company states: "To date, we have generated most of our platform and player revenue in the United States." As there is no specific geographical segment breakdown, we assume 60% of revenue and employment are in the U.S. and report those numbers in this table.

³⁴ Via 2020 Form 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001314727/260b4476-595e-4e96-847b-ba8d2369a2fd.pdf> The company reports 999 full-time employees in the U.S. out of a global total of 1,427. We calculate \$605 million in U.S. revenue using this U.S. to global proportion.

³⁵ Source: <https://www.reuters.com/article/us-ibm-results/cloud-growth-fuels-ibm-profit-beat-idUSKCN1UC2KQ>

³⁶ Marek, Lynne (27 February 2016). "Guess which Illinois company uses the most worker visas" Crain's Chicago Business. Retrieved 15 July 2016.

³⁷ Source: <https://www.businesstoday.in/current/corporate/capgeminireports-184-rise-in-q3-sales-digital-cloud-services-grow-over-10/story/420024.html>

³⁸ Proprietary industry report on IT consulting in the U.S. in 2020.



Endnotes (cont'd)

³⁹ Via Form 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001372612/26fd7fba-a31a-4591-99b3-02de1ea23d8a.pdf> U.S. revenue is stated as 72% of global revenue of \$770 million, therefore \$554 million. Company employment reported as 1,934. We take 96% of this number as U.S. employees, based on that being the reported proportion of property and equipment in the U.S.

⁴⁰ 2020 Revenue reported at: <https://www.globenewswire.com/news-release/2021/02/18/2177654/0/en/Sinch-AB-publ-Year-end-report-January-December-2020.html> 7.46 billion Swedish Krona of which 3.75 billion is U.S. as per annual report at: <https://investors.sinch.com/static-files/34c85e86-c75b-4914-a430-013f8d439265> Converted to \$432 million U.S. on July 25, 2021. 1,778 global employees of which we assume half, or 889, are U.S.-based on revenue proportion and the fact that after Stockholm, the U.S. office in Atlanta is the company's next largest.

⁴¹ Via Form 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0000932696/4d2691c4-d6a1-42b8-b8d3-439256332d53.pdf> Insight Enterprise's focus is cloud and data center transformation, connected workforce, and digital innovation to maximize the business value of IT. The company's 10-K reports that U.S. and Canada accounts for 79% of sales of \$8.34 billion or \$6.58 billion. We took 90% of that number to arrive at our U.S. estimate of \$5.93 billion. U.S. employment estimate: 7,847, based on 90% of North American reported headcount of 8,719.

⁴² Source: <https://adage.com/article/agency-news/deloittes-heat-wake-call-other-creative-shops/2176821>

⁴³ Source: <https://digiday.com/marketing/inside-deloitte-1-5-billion-ad-agency/>

⁴⁴ Source: <https://www.consultancy-me.com/consulting-industry>

⁴⁵ Proprietary research on consulting industry in U.S. in 2020.

⁴⁶ Via 2020 Form 10-K at: <https://verint.com/wp-content/uploads/VRNT-2021.01.31-Form-10-K-FINAL-3.31.21.pdf?ga=2.17426745.1847162107.1627064476-2084314077.1627064476> Reported U.S. revenue of \$555 million or 44% of global revenues of \$1.27 billion. Global employment of 6,500 reported, of which we took half as U.S.-based, or 3,250.

⁴⁷ Via Form 10-K at: <https://dropbox.gcs-web.com/node/9036/html> Filing reports \$1.914 billion of global revenue of which the U.S. is \$999 million. U.S. full-time employment reported as 2,364.

⁴⁸ Ibid.

⁴⁹ Source: <https://www.zoominfo.com/c/international-data-corporation/18678098>

⁵⁰ Proprietary industry research on U.S. domain sales in 2020.

⁵¹ Proprietary industry research on U.S. internet hosting services in 2020.

⁵² Alex Wilhelm, "Squarespace files for a direct listing on the NYSE," TechCrunch April 16, 2021.

⁵³ Source: <https://www.techradar.com/web-hosting/best-web-hosting-service-websites>

⁵⁴ Proprietary research on IT consulting in the U.S. in 2020.

⁵⁵ Via 2020 Form 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001640147/13f710c7-3329-4ce0-8804-55e95f5f29f5.pdf>. The company reports \$592 million in 2020 revenue, of which \$499.6 million is from the U.S. (84%). We took two thirds of global employment of 2,495 as U.S., therefore 1,647, as the company 10-K indicates it operates in 19 countries and we need to account for overseas workers.



Endnotes (cont'd)

⁵⁶ Source: <https://www.Owler.com/company/qlik>

⁵⁷ Source: <https://databricks.com/company/about-us>

⁵⁸ Dom Nicastro, "What is the difference between a CRM and a CDP? And why should you care?" CMSWire, February 24, 2021 <https://www.cmswire.com/customer-experience/whats-the-difference-between-a-crm-and-a-cdp-and-why-you-should-care/>

⁵⁹ "Top 10 CRM Software Vendors, Market Size and Market Forecast 2019-2024," Apps Run the World, November 4, 2020 <https://www.appsruntime.com/top-10-crm-software-vendors-and-market-forecast/>

⁶⁰ Shanhong Liu, Apr 13, 2021, Statista <https://www.statista.com/topics/2208/security-software/>

⁶¹ Source: <https://www.statista.com/topics/1176/online-advertising/>

⁶² IAB Internet Advertising Revenue Report, May 2020.

⁶³ Annual report at: https://www.publicisgroupe.com/sites/default/files/press-releases/2021-02/CP_Resultats_FY2020_GB.pdf Note that figures are reported in euros, which we converted at 1.22 to U.S. dollars at the time of our analysis.

⁶⁴ WPP annual report: <https://www.wpp.com/-/media/project/wpp/files/investors/2021/annual-report-2020/wpp-annual-report-2020-financial-statements.pdf?la=en>. Rationale for ratios and calculations appear in main text of report.

⁶⁵ Annual filing at: [https://s2.q4cdn.com/400719266/files/doc_financials/2020/ar/Omnicom-Group-Inc.-2020-Annual-Report\[1\].pdf](https://s2.q4cdn.com/400719266/files/doc_financials/2020/ar/Omnicom-Group-Inc.-2020-Annual-Report[1].pdf) / \$13.17 billion in global revenue reported. \$7.58 billion of all revenue is in North America therefore we assume 90%, or \$6.82 billion is U.S.-based. 56% of all revenues are advertising-related therefore U.S. ad revenue is \$3.82 billion and using a benchmark of 52% for digital advertising we arrive at our estimate of \$1,987 billion for U.S. internet-dependent advertising revenue. Annual filing reports 20,800 employees in the U.S. In line with ratios for revenues we assume 56% of these U.S. employees, or 11,648, are engaged in advertising-related activities, and we ascribe 52% of that figure to digital advertising to arrive at our U.S. internet-dependent estimate of 6,057 employees.

⁶⁶ Source: <https://www.toolbox.com/marketing/programmatic-advertising/guest-article/adtech-ma-in-2021-why-and-where-we-are-seeing-activity-ramp-up/>

⁶⁷ Note that Roku is covered in our section on hardware in Chapter 3.

⁶⁸ No Form 10-K is available as an S-1 prospectus was just filed in 2021, therefore we rely upon reports such as AppLovin which said the company took in \$1.45 billion in revenue in 2020 (with the same figure appearing in several other public reports for corroboration). <https://www.marketwatch.com/story/applovin-ipo-5-things-to-know-about-the-software-company-seeking-a-30-billion-valuation-11617836424> S-1 filing shows U.S. as 61% of global revenue: <https://sec.report/Document/0001193125-21-161989/> 61% of \$1.45 billion is \$884.5 million. There is no official report of headcount though LinkedIn cites 599, of which we estimate 500 are U.S.-based. <https://www.linkedin.com/company/applovin/>

⁶⁹ Based on the company's Form 10-K filing: \$2.07 billion global revenue with the Americas at \$895 million. We estimated the U.S. at 90%, or \$805 million. The company reports 2,594 employees, of which 1,006 are in France. Therefore 1,588 remain in other territories. We assume 39% of the 1,588, or 619, are U.S.-based, using the same proportion as U.S. to global revenue. With 29 offices in 19 countries and seven offices in U.S., we estimate the U.S. is 39% of global revenue. Applying that proportion to employees we arrive at our estimate of 619 for U.S. employees.

⁷⁰ Form 10-K filing at: <https://investors.thetradedesk.com/node/10666/html> reports \$863 million in global revenue and gross billings ratio of 86% to U.S., therefore U.S. revenue is \$719 million. Employee headcount is reported as 1,545 across 14 countries, with 66% in North America. We assume



Endnotes (cont'd)

90% of that is based in the U.S. for a total of 917.

⁷¹ SEC filing at: <https://investor.rubiconproject.com/node/10976/html> reports \$222 million in revenue, of which is \$162 million is in the U.S. We use the same ratio as U.S. to global revenue (73%) to arrive at our estimate of 435 U.S. employees.

⁷² Based on a report of \$175 million in revenue for fiscal year 2020 at <https://www.prnewswire.com/news-releases/nextroll-announces-5x-increase-in-profitability-product-led-growth-and-names-robin-bordoli-as-ceo-301109895.html> with 652 employees <https://pitchbook.com/profiles/company/53903-17#overview> and five offices, of which three are in the U.S. We calculate revenue and employment with the assumption that the U.S. equals two thirds of global figures for a total of \$115 million and 430 employees.

⁷³ Estimates based on information in a Form 10-K filing at: <https://investors.pubmatic.com/static-files/bfc7ecdb-078c-450f-a595-2a43347ac0ab> As of December 31, 2020, the company had 548 employees, with 198 located in the U.S. Revenue in fiscal year 2020 was \$149 million, of which the U.S. accounted for \$97 million.

⁷⁴ The company reported \$105 million in revenue and 500 employees. <https://www.zoominfo.com/c/openx-software-ltd/346014964>. We calculate revenue and employment with the assumption that the U.S. accounts for two thirds of global figures for a total of \$69 million and 330 employees.

⁷⁵ We assume 550 employees in 2020 and we assume half of employees, or 275, are U.S.-based. D&B Hoovers estimates \$121 million in revenue, and we assume half of that revenue is U.S.-based. <https://digiday.com/media/mediamath-explores-a-possible-sale/>

⁷⁶ We estimate 10% of the subtotal for the individually analyzed firms here and add \$291 million for the All Other category accordingly. We allocate 500 employees for this category to account for the lower efficiencies of startups and smaller firms.

⁷⁷ 10,300 U.S. employees reported at <https://www.statista.com/statistics/252007/number-of-full-time-employees-of-nielsen-in-the-united-states/> of which we allocate 20% or 2,060 to the internet ecosystem.

⁷⁸ Via 2020 Form 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001492633/60dfc321-8326-4d06-8f46-5664934fabf7.pdf>

⁷⁹ Via 2020 Form 10-K at: <https://ir.comscore.com/static-files/4a268418-aca5-4e0b-ad66-4058c094342e>

⁸⁰ Via 2020 Form 10-K at: <https://docoh.com/filing/1739936/0001564590-21-006682/MNTV-10K-2020FY>

⁸¹ The company is privately held therefore we used D&B Hoovers estimates plus anchored on industry benchmarks for U.S. to calculate global revenues and employment.

⁸² Calculated at 20% of subtotal of individually analyzed firms' revenue and employment.

⁸³ Figures based on our analysis of most recent company Form 10-K filing at: <https://investors.fiserv.com/index.php/static-files/29cf5bb5-583e-417f-a267-7fcac3d7fa53>

⁸⁴ Figures based on our analysis of most recent company Form 10-K filing at: [https://s22.q4cdn.com/211474323/files/doc_financials/2020/annual/2021-SSC-10-K-2020-Bookmarked-\(FILED\).pdf](https://s22.q4cdn.com/211474323/files/doc_financials/2020/annual/2021-SSC-10-K-2020-Bookmarked-(FILED).pdf)

⁸⁵ Figures and ratios derived from Form 10-K filing at: <https://investor.aciworldwide.com/static-files/7b73beb5-c52a-4b2f-86a7-006c6829c893>

⁸⁶ Via 2020 Form 10-K filing at: <https://ir.msci.com/static-files/1b5674fe-51b1-4917-87b0-a628dabb54ba>



Endnotes (cont'd)

⁸⁷ Via 2020 Form 10-K filing at: <https://investor.envestnet.com/sec-filings/all-sec-filings/content/0001628280-21-003457/0001628280-21-003457.pdf>

⁸⁸ Via 2020 Form 10-K filing at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001410384/2a061f02-0082-4d5a-a8ee-4c742795e5e2.pdf>. U.S. employees are stated in the 10-K. U.S. revenues are calculated at two thirds of global revenues, conservatively anchoring on other firms in this sector.

⁸⁹ Via 2020 Form 10-K filing at: <https://www.sec.gov/Archives/edgar/data/1073349/000107334920000095/epay-20200630.htm>

⁹⁰ Estimate based on figures at D&B Hoovers of \$234 million and 1,300 employees, to which we apply an industry benchmark of two thirds of revenue and employment as U.S.-based.

⁹¹ Via 2020 Form 10-K filing at: <https://cantaloupeinc.gcs-web.com/static-files/dac44b68-c38b-43ad-b422-284996e2701f>

⁹² Pre IPO financial information on MeridianLink states \$199 million in revenue to end of 2020. Our estimates take two thirds of revenue as U.S. and headcount is based on productivity per employee estimates for other firms in this sector. [https://www.renaissancecapital.com/IPO-Center/News/81338/Financial-software-provider-MeridianLink-files-for-an-estimated-\\$350-million](https://www.renaissancecapital.com/IPO-Center/News/81338/Financial-software-provider-MeridianLink-files-for-an-estimated-$350-million)

⁹³ Source: <https://elearningindustry.com/the-best-learning-management-systems-top-list>

⁹⁴ Source: <https://www.fortunebusinessinsights.com/industry-reports/learning-management-system-market-101376>

⁹⁵ Annual report at <https://corporate.amadeus.com/documents/en/investors/2020/quarterly-results/q4-2020/fy2020-consolidated-accounts.pdf> states \$2.17 billion euros, which is \$2.6 billion U.S. and that America represents \$821 million euros of \$2.17 billion euros, or 38%. 821 million euros in U.S. dollars equals \$980 million calculated on June 23, 2021. The company has 16,550 people and seven U.S. offices. Because company is headquartered in the EU, we take 25% as based in the U.S. for a total of 4,138, which would mean just over \$236,000 in productivity per employee. This figure is consistent with the productivity per employee of competitors in this sector.

⁹⁶ Public filings report global revenue of \$1.33 billion and 7,531 global employees. North American bookings are 64% of revenue; the U.S. is 90% of North America. Using these ratios North America is \$854 million and the U.S. is \$768 million. 2,404 (32%) of its 7,531 global employees are in the U.S. This represents approximately \$319,000 in productivity per employee, which is in line with industry benchmarks.

⁹⁷ Via D&B Hoovers, the company shows \$2.5 billion global revenue and 4,000 employees in 2020. On May 30, 2019, the company was acquired by affiliates of Siris Capital Group and Evergreen Coast Capital for \$4.4 billion. It is headquartered in the UK, with 113 global locations. We assume 20% of employees, or 800, are U.S.-based and assume the same proportion for revenue, or \$500 million.

⁹⁸ Via annual filing at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001594805/c3898d01-52b6-4d9b-87dc-21744e8ba90d.pdf>

⁹⁹ Source: <https://websitebuilder.org/blog/woocommerce-stats/>

¹⁰⁰ Source: <https://automattic.com/about/>

¹⁰¹ As reported at <https://woocommerce.com/posts/woocommerce-pricing/> "No setup charge and no monthly fees. You pay 2.9% plus \$0.30 for each transaction made with a U.S.-issued credit or debit cards." By our calculations, 2.9% of \$20 billion is 580 million (global revenue) and we estimate two thirds of that is U.S.-based, the same proportion as Shopify, for \$389 million. With 150 employees working in 32 countries, we estimate 100 are U.S.-based. <https://woocommerce.com/posts/woocommerce-is-hiring/>

¹⁰² Source: <https://investors.bigcommerce.com/static-files/e93d055c-4f19-4002-b271-512723bcda7b>



Endnotes (cont'd)

¹⁰³ Source: <https://www.websitetooldtester.com/en/blog/wocommerce-market-share/>

¹⁰⁴ Note: Ecwid acquired by Lightspeed in 2021.

¹⁰⁵ Source: <https://www.pinnaclecart.com/about-us/>

¹⁰⁶ Via annual filing at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001594805/c3898d01-52b6-4d9b-87dc-21744e8ba90d.pdf>

¹⁰⁷ Privately held therefore we used public sources used for estimates including <https://www.websitetooldtester.com/en/blog/wocommerce-market-share/> and <https://www.crunchbase.com/organization/wocommerce>.

¹⁰⁸ Via 2020 Form 10-K: <https://investors.bigcommerce.com/static-files/e93d055c-4f19-4002-b271-512723bcda7b>

¹⁰⁹ Industry report at <https://www.websitetooldtester.com/en/blog/wocommerce-market-share/> estimates that the top three vendors in this sector represent 60% of the market. We therefore allocate \$1.64 billion to the balance of this market to account for All Other vendors and add 1,500 workers, factoring in the lower scale and efficiencies of smaller firms and startups.

¹¹⁰ For example, FedEx's Custom Critical hires contractors or fleet owners as described here: <https://customcritical.fedex.com/us/owneroperator/general.shtml>

¹¹¹ Source: <https://www.sitepoint.com/the-rise-of-the-no-code-movement/>

¹¹² Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, Advertising, Promotions, and Marketing Managers at: <https://www.bls.gov/ooh/management/advertising-promotions-and-marketing-managers.htm>.

¹¹³ Source: https://www.ftc.gov/system/files/documents/public_comments/2018/08/ftc-2018-0048-d-0121-155298.pdf

¹¹⁴ Source: <https://www.sandvine.com/phenomena>

¹¹⁵ Source: <https://www.axios.com/bloomberg-media-consumer-subscription-revenue-34489fa9-cb19-4b17-a1fe-1ebee8d6d846.html>

¹¹⁶ Source: <https://www.thewrap.com/new-york-times-the-daily/>

¹¹⁷ Source: <https://digiday.com/media/the-new-york-times-aims-to-convert-newsletter-readers-into-paid-subscribers/>

¹¹⁸ Proprietary research on internet publishing and broadcasting in the U.S

¹¹⁹ Source: <https://www.niemanlab.org/2020/11/for-the-first-time-the-new-york-times-digital-subscriptions-generate-more-revenue-than-its-print-ones/>

¹²⁰ Source: <https://www.statista.com/statistics/183408/number-of-us-daily-newspapers-since-1975/>

¹²¹ Privately held company; estimates based on Forbes reporting at: <https://www.forbes.com/companies/bloomberg/?sh=5cd1310974a1>. Our percentage of U.S. internet revenue is based on a split of 80% digital and 20% non-digital and our internet employment is calculated at 63% as carried over from our previous studies.

¹²² Most recent Form 10-K filing of News Corp. breaks down revenues of \$9.08 billion as follows: digital real estate services: \$1.065 billion, subscription video services, \$1.88 billion, Dow Jones: \$1.59 billion, book publishing: \$1.66 billion, and news media: \$2.8 billion. \$3.76 billion of the \$9.08 billion in



Endnotes (cont'd)

revenue is attributed to U.S. and Canada, of which we assume 90% is in the U.S. (\$3.38 billion). We note that the 10-K reports that global digital subscriptions for The Wall Street Journal and Barron's account for \$2.8 billion of all revenue, which we assume half, or \$1.4 billion is in the U.S. We then deduct the \$2.8 billion from the \$9.08 billion and arrive at \$6.28 billion, and take 33% of that revenue, or \$2.07 billion, as revenue for general digital sources. Therefore \$1.4 billion plus \$2.07 billion equals \$3.47 billion attributable to U.S. digital revenues. For employment we use a multiplier of 1.6, derived from the ratio used in the calculations for Bloomberg, a comparable firm, to arrive at our estimate of 5,552 internet-dependent employees in the U.S.

¹²³ In March 2019 Fox Corporation became a standalone publicly traded company following the acquisition of 21st Century Fox by Disney. The most recent Fox Corporation 10-K reports 12.15 billion in revenues from cable and TV, including the 100% free, ad-supported video-on-demand streaming service Tubi, acquired by Fox in 2020. Using Nielsen's reported estimate of 25% of TV viewing now being online <https://www.nielsen.com/us/en/insights/report/2020/the-nielsen-total-audience-report-august-2020/> we compute 25% of revenues of \$12.15 billion as internet dependent, to arrive at our estimate of \$3.04 billion. We use the multiplier of 1.6 used elsewhere in this category to arrive at our U.S. internet-dependent employee figure of 4,864.

¹²⁴ RELX Group (formerly Reed Elsevier Group) owns the LexisNexis brand which offers online and hard copy legal, corporate, and government information. RELX primarily operates in North America and Europe. RELX PLC and RELX NV each own 50% of Reed Elsevier Group. 40% of the firm's revenues come from LexisNexis, and we apply this conservative estimate to overall revenue and employment.

¹²⁵ Our estimate is based on reports of \$5.9 billion in revenue in 2019 of which we estimate is \$1.94 billion is U.S. internet-based revenue. Revenue and employment estimates are based on ratios for comparable businesses.

¹²⁶ Via the Gannett Form 10-K: "In 2020, total Digital advertising and marketing services revenues were \$808.4 million, or 24% of our total revenues. Our U.S. media network, which includes USA TODAY and our local properties, has more than 4,350 journalists. We expect to and are invested in growing the number of journalists, as we seek to accelerate growth of a subscription-led business model, anchored on high-quality, original, impactful journalism. Our U.S. media network averaged 150 million unique visitors monthly during 2020 who access content through desktops, laptops, smartphones, and tablets. As of December 31, 2020 we had approximately 1.1 million digital-only subscribers, up 29% year over year... As of December 31, 2020, we employed approximately 18,100 employees in the U.S." To compute internet-dependent employment in the U.S. we use the same formula for dollars per employee as The New York Times Digital, a comparable firm. That multiplier is 2.56. We multiply \$808 million by 2.56 to arrive at our estimate of 2,068 employees.

¹²⁷ Internet-related employment calculated at rate of 14% of total of 18,100 U.S. employees as reported in the Gannett Form 10-K: 14% being the reported proportion of digital advertising and marketing revenues.

¹²⁸ Estimate is based on digital revenues of \$130 million plus \$146 million plus \$155 million reported for the first three quarters of 2020 and reported in The New York Times on November 5, 2020. We assume \$155 million of digital revenue for Q4 2020.

¹²⁹ We calculated % of internet employees at same % as revenue. The total headcount is 4500 (reported at <https://www.statista.com/statistics/192894/number-of-employees-at-the-new-york-times-company/>), therefore we estimate 1,500 for digital.

¹³⁰ Our estimate of revenue and employment for WashingtonPost.com is anchored on figures for one of its primary competitors, New York Times Digital. We therefore assume two thirds revenue and employment levels.

¹³¹ The \$20.7 billion of revenue generated by the individually enumerated firms required 37,910 employees according to our calculations, which represents \$546,000 per employee. We assume that long tail titles are half as efficient and so assume \$273,000 per employee.

¹³² To estimate the revenue for the long tail we take Gannett's revenue of \$808 million, subtract our estimate of USA TODAY's standalone revenue (\$275 million) and conclude that the local Gannett papers earn \$840,000 per media brand (daily and weekly). We apply that figure to the 718 publishers in the long tail that aren't part of Gannett's network.



Endnotes (cont'd)

¹³³ Source: <https://www.theverge.com/2020/11/19/21575599/buzzfeed-acquires-huffpost-verizon-jonah-peretti-tumblr>

¹³⁴ Source: <https://variety.com/2019/digital/news/vice-media-layoffs-250-employees-1203125890/>

¹³⁵ Source: <https://www.nytimes.com/2020/02/07/business/media/the-information-jessica-lessin.html>

¹³⁶ Employment of 3,600 reported at: "ViacomCBS sells CNET Media for less than half what CBS paid in 2008" The Los Angeles Times, September 14, 2020. We estimate 70% of employment is based in the U.S. (deducting offices in the UK and Brazil). We take the same proportion of employment to revenue as Zillow to arrive at our U.S. revenue estimate of \$2.8 billion.

¹³⁷ Revenue estimate as reported in The Wall Street Journal, February 11, 2020 at <https://www.wsj.com/articles/vice-media-raised-money-at-a-sky-high-valuation-now-the-bill-is-coming-due-11581450643>

¹³⁸ We base our estimate of 2,046 on global headcount of 3,100 referenced at <https://variety.com/2020/digital/news/vice-media-layoffs-155-employees-covid19-1234607610/> and assume that two thirds are based in the U.S.

¹³⁹ We estimate \$300 million in annual revenue based on this report in The Wall Street Journal on Oct. 26, 2020: <https://www.wsj.com/articles/buzzfeed-expects-to-break-even-this-year-thanks-to-heavy-cost-cuts-11603738660>

¹⁴⁰ Mid-year layoffs at BuzzFeed of 50 people were reported as 5.7% of U.S. staff. Therefore, the total U.S. headcount for 2020 is 877 and we deduct the 50 laid off workers for a total of 827 employees. <https://www.thewrap.com/buzzfeed-lays-off-nearly-70-of-furloughed-staff/>

¹⁴¹ Revenue and employment information as reported in 2020 Form 10-K filing.

¹⁴² Employment calculated at similar ratio to Leaf Media.

¹⁴³ Axel Springer-owned Insider Inc.'s revenues were up 20% year-over-year. Axel Springer says it crossed \$100 million in revenue in 2019 and is profitable. <https://digiday.com/media/following-a-profitable-year-insider-inc-is-eyeing-responsible-business-growth/>

¹⁴⁴ Employment estimate based on firms with similar revenue in this section.

¹⁴⁵ Revenue of \$100 million reported in Axios at: <https://www.axios.com/vox-media-studios-revenue-b4ce29a1-5393-4e30-944d-83a1a5ccdd3b.html>

¹⁴⁶ Employee headcount as reported on LinkedIn: <https://www.linkedin.com/company/vox-media-inc/>

¹⁴⁷ The privately held Penske Media Corporation owns Hollywoodlife.com, Deadline.com, Variety.com, 50% of Rolling Stone as well as a variety of digital media properties covering sports, fashion, and technology. According to its website pmc.com the firm's digital media properties attract 378 million MAUs and close to half a billion social media followers. Revenue and headcount estimates are from <https://www.zoominfo.com/c/penske-media-corporation/347966955>.

¹⁴⁸ We allow 10% for omitted larger digital publishers and account for the long tail of individual to small digital businesses in the section on the creator economy.

¹⁴⁹ Source: <https://www.nielsen.com/us/en/insights/report/2020/the-nielsen-total-audience-report-august-2020/>

¹⁵⁰ Source: <https://www.fiercevideo.com/video/older-americans-are-increasingly-cutting-cord>



Endnotes (cont'd)

¹⁵¹ Source: <https://www.statista.com/statistics/443332/reddit-monthly-visitors/>

¹⁵² Source: <https://digiday.com/media/how-marketers-are-using-reddit-to-build-loyalty-and-drive-sales/>

¹⁵³ Source: <https://www.niemanlab.org/2019/04/gizmodo-media-group-is-sold-to-a-private-equity-firm-and-univision-is-out-of-the-english-language-web-site-business/>

¹⁵⁴ The rationale for our estimates is as follows: Of \$77 billion global revenue and 114,400 employees cited in company annual report, we assume half are U.S.-based (\$38.5 billion and 52,200). Based on revenue by segment cited at: <https://www.statista.com/statistics/279272/proportion-of-sonys-sales-by-business/> we assume 100% of the following segments are internet dependent: games 24% of revenue (\$9.24 billion), music 10% (\$3.85 billion), mobile 20% (\$7.7 billion). Therefore, U.S. internet-dependent revenue is \$20.79 billion, or 27% of global revenue. We apply the same ratio to employment to arrive at 30,888 employees.

¹⁵⁵ We determined that based on Statista revenue breakout by region that the U.S. is 68%. We apply 68% to arrive at \$5 billion for the subscription proportion of the media networks segment reported in the Form 10-K. Of the \$6.4 billion of advertising revenue reported in the 10-K we assume the majority of this revenue is earned in terrestrial TV and take one third or \$2.13 billion for U.S. digital. For studio entertainment segment reported in the Form 10-K, we assume \$2 billion of the \$6 billion of global revenues are U.S. digital. For the employment estimate: There are 203,000 global employees are reported in 2020 Form 10-K filing. We take an employees-per-dollar as the average of the top five firms, \$1.37, for our employment calculation of 12,500. This is admittedly a sizable jump in U.S. digital revenue since the time of our last report and we attribute the sharp increase to the digitization of many of the company's products and services as well as their DTC channels which are internet dependent.

¹⁵⁶ TV and cable reported as 88% of revenues via the company's 10-K filing, therefore \$27.8 billion times .088 equals \$24.4 billion. We assume two thirds is in the U.S. or \$16.1 billion and take 54%, the eMarketer standard for digital advertising of \$16.1 billion for U.S. digital advertising to arrive at \$8.7 billion. We then add one third of publishing for digital (\$814 million times .33 equals \$269 million). Therefore \$8.7 billion plus \$269 million for a total of \$8.97 billion. Next, we calculate \$8.97 billion as 32% of total company revenues of \$27.8 billion and apply the same ratio to employment to get 23,990 times .32 for a total of 7,677.

¹⁵⁷ Forbes reports \$11.9 billion for Hearst revenues in 2019 <https://www.forbes.com/companies/hearst/?sh=3487702f2e29>; We estimate 54% of revenues are internet-related and use the same proportion to calculate internet employment.

¹⁵⁸ As per the company's 10-K filing, \$3.075 billion of \$4.75 billion revenue is in the U.S. and we apply the same proportion (65%) to the reported total company employment of 8,700 to arrive at our estimate of 5,655 U.S. internet-based employees.

¹⁵⁹ Our estimate is based on the following: \$4.24 billion is cited as U.S. advertising revenue in the company's 10-K filing. We assume 54% (the eMarketer standard for digital advertising) is internet dependent, thus arriving at our figure of \$2.29 billion. We apply the same ratio of U.S. internet-dependent revenue (i.e., \$2.29 billion out of global revenue of \$11.14 billion, or 20.55% and arrive at our estimate of 1,886 internet-dependent employees in the U.S.

¹⁶⁰ Advance Publications is a leading newspaper and magazine publisher with several dozen titles and owns many digital entertainment channels. Advance owns Condé Nast and is the majority shareholder in Reddit, a Comscore top 50 U.S. site with 430 million MAUs. <https://www.theverge.com/2020/12/1/21754984/reddit-dau-daily-users-revealed>. Advance is privately held. D&B Hoovers estimates \$5 billion in revenue and 37,000 employees. Pew Center reports "digital advertising accounted for 35% of newspaper advertising revenue in 2018, based on this analysis of publicly traded newspaper companies." <https://www.journalism.org/fact-sheet/newspapers/> Based on this estimate we ascribe \$1.75 billion and 12,950 employees as internet dependent in the U.S.

¹⁶¹ Our estimate is based on the following: The company's Q3 2020 report at: https://s2.q4cdn.com/417187916/files/doc_financials/2020/q3/FINAL-UCI-Q3-2020-Reporting-Package.pdf states \$628 million in revenue of which \$580 million is attributed to its media networks segment. We make a conservative assumption that 30% of this segment, which includes cable and over the air TV as well as a variety of digital properties, is internet



Endnotes (cont'd)

dependent. We thus arrive at \$174 million and annualize the figure to arrive at \$696 million. We compute the ratio of \$696 million as a proportion of fiscal year revenues of \$2.7 billion at 26% and apply it to the total company employment figure of 4,000 to arrive at 1,040 for our internet-dependent employment estimate.

¹⁶² Our estimate is based on the following: The company's 10-K filing reported \$377 million in digital advertising revenues and \$73 million for digital and other consumer related revenue, therefore we attribute a total of \$450 million to U.S. internet-dependent revenue. This figure represents 22% of the company's total reported revenue of \$2.08 billion and we apply the same ratio to estimated employment of 7,924 reported at <https://www.statista.com/statistics/686194/meredith-corporation-number-of-employees/> to arrive at 1,743 for our estimate of internet-dependent employment.

¹⁶³ Digital revenue figures as reported in most recent Nexstar Form 10-K. We use the same proportion to estimate digital employment.

¹⁶⁴ Costar's online marketplace revenues reported in the company's 10-K filing are \$694 million. As this reporting segment is for North America, which includes Canada, we compute 90% of revenues for the U.S., or \$625 million. \$625 million equals 44.6% of total revenues of \$1.4 billion. The 10-K also reports 4,337 employees. We apply the proportion of 44.6% for online marketplace to all revenues to arrive at our estimate of 1,934 U.S. internet-dependent employees.

¹⁶⁵ We assume 20% for the 'All Other' category in this sector based on the sizable number of local providers.

¹⁶⁶ Source: <https://www.edisonresearch.com/the-infinite-dial-2020/>

¹⁶⁷ Source: <https://thefeed.libsyn.com/170-one-star-power>

¹⁶⁸ Source: <https://www.iab.com/news/u-s-podcast-ad-revenues-near-1-billion-according-to-iab/>

¹⁶⁹ Source: <https://www.vulture.com/2021/01/apple-podcast-subscription-service-netflix.html>

¹⁷⁰ Source: <https://www.digitalmusicnews.com/2021/02/23/spotify-paid-podcast-subscriptions/>

¹⁷¹ Source: <https://fortune.com/2021/02/23/spotify-podcast-obama-springsteen-daniel-ek/>

¹⁷² Source: <https://www.musicbusinessworldwide.com/soundcloud-revenues-soared-by-37-in-2019-and-its-just-posted-its-first-profitable-quarter/>

¹⁷³ Source: <https://www.mixcloud.com/about/>

¹⁷⁴ Source: <https://press.soundcloud.com/197001-soundcloud-introduces-fan-powered-royalties>

¹⁷⁵ For 2020 our U.S. estimate is \$1.91 billion. Global revenue converted to U.S. dollars is \$8.26 billion. We take 26.5% as North America, based on figures in annual report. Using a GDP calculation, we take 88% of North American revenues as U.S. to arrive at \$1.91 billion. Our U.S. employment figure is as reported in company annual report at: https://s22.q4cdn.com/540910603/files/doc_financials/2019/ar/Spotify-2020-AGM-Annual-Report-on-Form-20-F.pdf

¹⁷⁶ We assume Pandora/Sirius XM has U.S. revenues of 80% of Spotify's based on Pandora's MAUs of 58 million in 2020 and Spotify's 75 million MAUs in 2020. We assume Pandora/Sirius' employee productivity is 90% of Spotify's therefore we estimate the revenue to be 80% of \$1.91 billion, which is \$1.53 billion and employment to be 1,870, accounted for by the

¹⁷⁷ From iHeart Media's 10-K: "Its iHeartRadio digital service available across more than 250 platforms and 2,000 devices including smart speakers, smartphones, TVs, and gaming consoles; through its influencers; social; branded iconic live music events; and podcasts." The most recent 10-K reports



Endnotes (cont'd)

\$273 million as revenue from digital services for May 2 through Dec 31, 2019, therefore we annualize that to \$409 million (16% of total revenues); 16% of 11,000 employees is 1,760. As a legacy media organization, we assume lower productivity than digital-first organizations, but we still assume twice the productivity of legacy media organization benchmarks for a total of \$409 million (16% of total revenues) is generated by 880 employees, or 8% of total employees.

¹⁷⁸ Using the proportion of digital to broadcast revenues of competitor iHeart Media we assign 16% of revenues reported in the 10-K to digital to arrive at \$218 million and assign a comparable number of internet-dependent employees.

¹⁷⁹ Owned by private firm Project Panther Bidco Ltd. Annual report sourced at <https://www.musicbusinessworldwide.com/tidal-and-soundcloud-now-neck-and-neck-in-revenue-terms-as-jay-z-streaming-platforms-growth-slowed-in-2019/> reports \$167 million in revenue and \$100.6 million as U.S. revenue. For our employment estimate of 107 we assume productivity at a rate comparable to competitor Spotify.

¹⁸⁰ In its annual report sourced at <https://www.musicbusinessworldwide.com/soundcloud-revenues-soared-by-37-in-2019-and-its-just-posted-its-first-profitable-quarter/> the company reports offices in Berlin (HQ), London, and New York and \$166 million in revenue and 1,262 employees. We attribute 30% of revenue and employee headcount to the U.S. (to account for a slightly larger operation at the European headquarters) or \$49.8 million and 379 employees.

¹⁸¹ With 75 million MAUs and 5.7 million podcasts, TuneIn is one of the most widely used streaming audio platforms in the world, available as a free ad-supported product and via premium subscription. D&B Hoovers estimates \$74 million in revenue and 200 employees, and we attribute half of the revenue to the U.S. and all the employment.

¹⁸² Source: <https://www.marketwatch.com/story/videogames-are-a-bigger-industry-than-sports-and-movies-combined-thanks-to-the-pandemic-11608654990>

¹⁸³ Source: <https://www.limelight.com/resources/white-paper/state-of-online-gaming-2020/>

¹⁸⁴ Source: <https://www.theverge.com/2021/5/14/22436214/itch-io-waives-sales-fees-creator-day-indie-games>

¹⁸⁵ Source: <https://www.statista.com/statistics/552623/number-games-released-steam/>

¹⁸⁶ Source: <https://www.pcgamer.com/steam-had-120-million-monthly-users-in-2020/>

¹⁸⁷ Source: <https://venturebeat.com/2020/06/15/epic-games-shareholders-seeking-to-sell-stake-for-750-million-at-17-billion-valuation/>

¹⁸⁸ Source: <https://www.theesa.com/about-esa/#membership>

¹⁸⁹ Net revenues from international sales accounted for approximately 52% in 2020. Therefore, the remaining 48% of revenues can be attributed to the U.S. as digital/online revenues. 48% of \$6.6 billion in digital revenues (of the company total for 2020 of \$8.1 billion) is \$3.17 billion. Using the same ratio of U.S. digital to overall revenues (\$3.17 billion of \$8.1 billion or 39%), we ascribe 3,598 of the company's 9,200 global employees in the U.S. as internet dependent.

¹⁹⁰ To estimate Steam's revenue for 2020 we use the following formula: We take the last reported figure of \$4.3 billion in global revenue from 2017 (<https://www.statista.com/topics/4282/steam/>), at which time the platform had 67 million MAUs (<https://www.statista.com/statistics/733277/number-stream-dau-mau/>) and to account for the platform's current 120 million MAUs (ibid). Assuming revenue per MAU is constant we estimate in global revenue for 2020 as \$7.7 billion. To estimate the proportion of U.S. to global revenue we take 40% from the number of users in this Steam survey that cite their first language as English (which was 42%) and we assume the vast majority of those are U.S.-based.



Endnotes (cont'd)

¹⁹¹ Source: <https://www.linkedin.com/company/valve-corporation/> cites 918 in house employees at the Washington state HQ.

¹⁹² D&B Hoovers says 903 employees. The company website reports main offices in U.S. and 40 in other cities globally. We assume half of company revenue and employment is in the U.S., using benchmarks from other comparable firms in this category. "Revenue for 2020 is forecast to be \$5 billion." <https://venturebeat.com/2020/06/15/epic-games-shareholders-seeking-to-sell-stake-for-750-million-at-17-billion-valuation/>

¹⁹³ From the company's 2020 10-K: \$5.5 billion of global revenue is reported of which \$4.3 billion or 78% is categorized as digital revenue. North American revenue is reported as \$2.27 billion, of which we attribute 90%, or \$2.04 billion to the U.S. We then take the ratio of 78% for digital revenue and apply it to the U.S. revenue figure to arrive at \$1.6 billion for our estimate of U.S. internet-dependent revenue. Also reported in the 10-K are 9,800 global employees, of which 6,000 are not located in the U.S. therefore we calculate U.S. internet-dependent employment as 78% of 3,800 or 2,964.

¹⁹⁴ From the company's 2020 10-K: \$3.1 billion revenue, of which \$1.78 billion is in the U.S. (57.4%) and \$2.38 billion is digital online revenue (76.7%). Therefore, we assume U.S. digital revenue as 77% of \$1.78 billion, or \$1.371 billion. As of March 31, 2020, the company reports 5,800 full-time employees, of which 3,123 were employed outside of the U.S.; therefore 2,677 in U.S. and we take 77% of that figure to arrive at our estimate of 2,061 as U.S. internet-dependent employees.

¹⁹⁵ The company's 2020 10-K reports \$1.97 billion in revenue, of which \$1.2 billion is in the U.S. (and \$1.6 billion is mobile). Of the company's 2,273 employees (<https://www.linkedin.com/company/zynga/>) we assume 60%, or 1364, are U.S.-based.

¹⁹⁶ Our employment estimate is calculated as follows: We take 425 U.S. employees and attribute 82%, or 349, to digital U.S. employment. Note that 82% is the figure reported for the company's digital revenue below. Revenue: "In the fiscal year 2020, which ended in March 2020, Ubisoft generated 1.53 billion euros in sales. That same year, approximately 82% of Ubisoft's sales were attributed to the digital format." (<https://www.statista.com/statistics/328291/ubisoft-annual-sales/>) Of the 746 million euros in revenue reported for the U.S. and Canada we converted to \$889 million USD on March 6, 2021. (<https://www.statista.com/statistics/269673/sales-of-ubisoft-by-region-worldwide/>) We attributed 82% of that to digital for revenue of \$729 million.

¹⁹⁷ Via D&B Hoovers: "Nintendo of America is the Western Hemisphere distribution headquarters for Japan's Nintendo, which makes the #1 home game console, Wii, which is motion controlled and able to access Netflix. It also makes the number one handheld game console, Nintendo DS, which features two screens and intuitive touch controls. On those consoles, users can access and play such classic games as Mario Bros., Donkey Kong, Pokémon, and Zelda." The company has \$600 million in revenue and 955 employees are attributed to the U.S. operations.

¹⁹⁸ Revenue grew 56% from \$325.0 million in 2018 to \$508.4 million in 2019 and grew 82% to \$923.9 million in 2020. S-1 filings says 68% of business is in the U.S. and Canada. We take 90% of this figure of \$628 million to arrive at our estimate of \$565 million for U.S. revenues (90% of 68% is 61%). We assume three quarters of the 960 full-time employees are in the U.S., or 720. S-1 filing: <https://www.sec.gov/Archives/edgar/data/1315098/000119312521049767/d87104ds1a.htm>

¹⁹⁹ Source: <https://finance.yahoo.com/news/data-users-spent-nearly-1-t-hours-streaming-in-2020-with-disney-breakout-platform-162632224.html>

²⁰⁰ Source: <https://variety.com/2021/film/news/streaming-service-subscriptions-global-box-office-study-1234932776/>

²⁰¹ Source: <https://www.statista.com/statistics/289657/youtube-global-quarterly-advertising-revenues/>

²⁰² Source: <https://www.youtube.com/intl/en-GB/about/press/>

²⁰³ Source: <https://twitchtracker.com/statistics>, accessed February 8, 2021

²⁰⁴ Source: <https://www.forbes.com/sites/sergeiklebnikov/2020/05/22/streaming-wars-continue-heres-how-much-netflix-amazon-disney-and-their-rivals-are-spending-on-new-content/>



Endnotes (cont'd)

²⁰⁵ Source: <https://www.theverge.com/2020/12/22/22195072/vimeo-iac-2021-independent-public-company-video-streaming>

²⁰⁶ Source: <https://www.billboard.com/articles/business/8457733/vevo-video-apps-website-shutting-down>

²⁰⁷ Source: <https://www.cordcuttersnews.com/disney-will-generate-11-2-billion-in-direct-to-consumer-revenue-in-2020/>

²⁰⁸ Source: <https://www.cordcuttersnews.com/disney-will-generate-11-2-billion-in-direct-to-consumer-revenue-in-2020/>

²⁰⁹ Via Netflix 2020 10-K filing.

²¹⁰ Source: <https://www.statista.com/chart/20345/netflix-subscriber-growth-by-region/>

²¹¹ Source: <https://www.sandvine.com/phenomena>

²¹² Via the Netflix 2020 10-K filing: \$11.5 billion in revenue reported for the U.S. and Canada. We take 90% for the U.S. 9,400 global employees are reported across 14 locations in 10 countries. We conservatively estimate that half of global employees are U.S.-based.

²¹³ Via Lions Gate 2020 10-K filing at <http://otp.investis.com/clients/us/lionsgate/SEC/sec-show.aspx?FilingId=14178757&Cik=0000929351&Type=PDF&hasPdf=1> the company's overall revenues across its motion picture, television production, and media networks segments is reported as \$3.9 billion. Based on reporting of the U.S. media networks revenue as 98% of global revenue we apply 98% to the 18% of overall revenues attributed to D2C streaming by analysts MacQuarie Research at <https://www.cordcuttersnews.com/disney-will-generate-11-2-billion-in-direct-to-consumer-revenue-in-2020/> and apply the same ratios to U.S. internet-dependent employment. As a comparison check we find the productivity per employee to be in line with that of competitor Netflix.

²¹⁴ Via the AMC Networks 10-K filing at <https://investors.amcnetworks.com/static-files/79822b5a-a035-4a9d-b3cc-3af3c5e6f3cb> we find that that the U.S. represents 75% of media revenues, or \$2.1 billion of \$2.8 billion. Using 6% as the percentage of firm revenues attributed to streaming at <https://www.cordcuttersnews.com/disney-will-generate-11-2-billion-in-direct-to-consumer-revenue-in-2020/> we apply it to the U.S. proportion of revenues and employment in the 10-K to arrive at our estimate.

²¹⁵ Source: <https://www.forbes.com/sites/susanadams/2020/04/03/the-language-app-thats-helping-bored-people-get-through-the-lock-down/?sh=7ad7af542c31>

²¹⁶ Source: <https://www.zippia.com/advice/how-does-duolingo-make-money/>

²¹⁷ Source: <https://www.wsj.com/articles/duolingo-valued-at-2-4-billion-in-fundraising-round-11605700806>

²¹⁸ *ibid*

²¹⁹ Source: <https://blog.getlatka.com/15-million-revenue-skillshare-shows-learning-platforms-how-its-done/>

²²⁰ "edEx Exit" Harvard Magazine September-October 2021.

²²¹ Apollo was acquired by a private equity group in 2017. Based on the D&B Hoovers description the company had \$2.1 billion in revenue in 2020. Our estimates for internet-dependent revenue and employment in the U.S. are predicated on similar rules applied to others in this industry plus ratios used in our 2017 report, at which time there was a 10-K filing for the company as it was a publicly traded firm. "The for-profit Apollo Education Group provides educational programs through a number of subsidiaries, including online stalwart University of Phoenix. The largest private university in the U.S., the



Endnotes (cont'd)

University of Phoenix accounts for the majority of Apollo's sales; it offers degree programs ranging from associates to doctoral." We assume all revenue as U.S., and we use industry benchmarks derived from the competitors analyzed in this section to arrive at our employment estimate of 7,500.

²²² Via the company's 2020 10-K at: <https://investors.zoom.us/node/8631/html>. Revenue for The Americas segment was \$1.83 billion of which we take 80%, or \$1.46 billion as U.S. U.S. employment was reported as 2,662 in the 10-K filing.

²²³ D&B Hoovers estimates \$2.7 billion in revenue and 10,000 employees while Forbes estimates \$3.1 billion in revenue and no employment (<https://www.forbes.com/companies/follett/?sh=451f27f21513>). Based on the D&B Hoovers description that follows we assume one third of revenue of the midway point of \$2.9 billion in digital and use the same ratio for our employment estimate. "Follett boasts more than 1,200 campus bookshops and 1,700 eFollett online stores nationwide. It provides a selection of school supplies, trade books, technology, fan gear, and textbooks. Alongside its physical retail operations is an extensive suite of digital products and services, including e-books, e-commerce sites, library management system software, and professional services such as curriculum consultancy and inventory management. The company sells course materials and other products under bkstr.com. All told, Follett counts around 80,000 schools as customers. Today, the Follett Corporation is a \$2.7 billion business."

²²⁴ Strategic Education Inc. (SEI) is the parent company of Strayer University (home to programs such as the online MBA offered by the Jack Welch Management Institute), Capella Education Co, Dev Mountain, and Hackbright Academy, which provides training for female software engineers. SEI's 2020 10-K filing reports \$1.03 billion in revenue, of which all but \$23 million is from the U.S. The 10-K states that the courses it offers are either "predominantly online" or "exclusively online" so we estimate \$905 million. The 10-K reports 3,769 full-time employees, of which 912 are outside of the U.S., and we take 90% of the 2,767 to arrive at our U.S. internet-dependent employee estimate.

²²⁵ The company's 2020 10-K filing reports \$844 million in revenue and 4,625 employees. In our previous report we used a statistic in the 10-K that stated 80% of students were online. This percentage is not reported in the 2020 10-K, but we make the assumption that it is similar for 2020 and take 75% of the reported revenue as internet dependent. The filing also reports 4,625 employees in the U.S., and we also estimate 75% of this figure as internet dependent.

²²⁶ We take 90% of the estimated \$608 million and 4,197 employees as in the U.S. (https://growjo.com/company/Varsity_Tutors)

²²⁷ The company's 2020 10-K filing reports \$1.48 billion global revenue, of which \$324 million is international, therefore \$1.16 billion is in the U.S. and we assume half is digital and we assume half of the 6,000 employees in the U.S. reported in the filing are internet dependent.

²²⁸ 2020 10-K filing states: "Our academic institutions offer a quality postsecondary education primarily online" so we conservatively estimate two thirds of revenues, or \$453 million of \$687 million are internet dependent. We estimate that 3,102 of the 4,700 employees in the U.S. are internet dependent.

²²⁹ 2020 10-K filing states that 90,400 of 92,500 (98%) of students are online. We therefore attribute 98% of reported APEI revenue (\$280 million of \$286 million) and calculate employment of admin and related full-time employees at 98% and take half of the reported combination full-time and part-time teaching faculty to arrive at our estimate of 2,377 U.S. digital employment.

²³⁰ 2020 10-K describes the company as a "pioneer in online learning for hospitals" with revenue of \$254 million and 1,037 full-time employees and 32 part-time employees. We therefore take half of the part-time employees and arrive at our total of 1,053.

²³¹ Revenue estimate of \$400 million based on: <https://www.forbes.com/sites/susanadams/2020/07/15/online-learning-platform-udemy-said-to-seek-funding-at-3-billion-valuation/?sh=4ec2345e6fbc>. We assume half of revenues are U.S.-based.

²³² 3,963 employees reported at <https://growjo.com/company/Udemy>. As the company has its headquarters in San Francisco we assume half of these employees are in the U.S.

²³³ 2020 revenue of \$396 million as reported at D&B Hoovers. We assume half is based in the U.S.



Endnotes (cont'd)

²³⁴ 2,300 global employees reported at <https://www.g2.com/products/skillsoft/reviews>. We assume half of the employees are in the U.S.

²³⁵ 2020 revenue of \$294 million as reported at: <https://sec.report/Document/0001193125-21-071525/>. The company's S-1 filing also reports 51% of revenues generated outside of the U.S.

²³⁶ 2,460 employees and we assume two thirds are in the U.S. <https://craft.co/coursea>

²³⁷ D&B Hoovers reports \$119 million in revenue and 893 employees. The company was acquired by a private equity firm in 2018. <https://finance.yahoo.com/news/francisco-partners-acquire-renaissance-170000959.htm>

²³⁸ Source: <https://growjo.com/company/Outschool>

²³⁹ Revenue figure from The Wall Street Journal: <https://www.wsj.com/articles/duolingo-valued-at-2-4-billion-in-fundraising-round-11605700806>. We assume half of global revenues are in the U.S. Employment figures are from <https://triblive.com/local/pittsburgh-allegheeny/duolingo-touts-1-5b-valuation-language-company-to-hire-100-more-people-mostly-in-pittsburgh/>

²⁴⁰ Source: <https://iblnews.org/course-hero-100m-in-revenue-1m-subscribers-and-a-valuation-of-1-1-billion/>

²⁴¹ Revenue estimate based on: <https://siliconangle.com/2020/11/03/now-profitable-udacity-raises-75m-debt-drive-enterprise-growth/> Employment figure based on: <https://techcrunch.com/2019/04/09/udacity-restructures-operations-lays-off-20-percent-of-its-workforce/>. We estimate half of revenue is from the U.S. and two thirds of employees are in the U.S.

²⁴² We calculate the 'All Other' category at 10% of the total of \$9.14 billion (\$914 million) and 39,701 employees (3,970).

²⁴³ Source: <https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/>

²⁴⁴ Source: <https://www.digitalcommerce360.com/article/us-ecommerce-sales/>

²⁴⁵ Source: <https://www.etailinsights.com/online-retailer-market-size>

²⁴⁶ Source: <https://www.geekwire.com/2020/walmarts-quarterly-u-s-ecommerce-sales-top-10b-retail-giant-prepares-challenge-amazon-prime/>

²⁴⁷ Source: <https://ecommercedb.com/en/store/apple.com>

²⁴⁸ Source: Fortune, August 19, 2020.

²⁴⁹ Source: <https://ecommercedb.com/en/store/bestbuy.com>

²⁵⁰ Source: https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf

²⁵¹ Via the company's 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0000104169/598c8825-536a-4371-ab8a-98b9ee761c43.pdf>

²⁵² Via the company's 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0000320193/7b5717ca-6222-48e6-801c-9ea28feef86.pdf>

²⁵³ Via the company's 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001616707/db9faad5-8962-4135-a35b-2419392ed51e.pdf>

²⁵⁴ Via the company's 10-K at: https://otp.tools.investis.com/clients/us/home_depot/SEC/sec-show.aspx?FilingId=14822776&Cik=0000354950&Type=PDF&hasPdf=1



Endnotes (cont'd)

²⁵⁵ Interactive Advertising Bureau, 250 Direct Brand Products to Watch, 2020.

²⁵⁶ Marketplace Pulse <https://www.marketplacepulse.com/articles/amazon-gmv-in-2020> Feb. 3, 2021

²⁵⁷ Source: <https://www.feedbackexpress.com/amazon-1029528-new-sellers-year-plus-stats/>

²⁵⁸ Source: <https://www.junglescout.com/blog/how-much-money-amazon-sellers-make/>

²⁵⁹ Source: https://www.webretailer.com/b/top-amazon-marketplace-sellers/#Top_Amazoncom_Sellers

²⁶⁰ Source: <https://smallbiztrends.com/2021/02/ebay-statistics.html>

²⁶¹ Source: <https://www.statista.com/topics/2501/etsy/#dossierSummary>

²⁶² Source: <https://smartmoneymamas.com/side-hustle-showcase-truth-behind-etsy/>

²⁶³ Source: <https://aimgroup.com/2021/02/11/craigslist-traffic-revenue-fell-radically-in-2020/>

²⁶⁴ Source: <https://digiday.com/marketing/how-shopifys-app-ecosystem-boosted-its-core-business/>

²⁶⁵ Source: <https://www.fxcintel.com/research/analysis/shopify-gmv-near-doubled-over-2020>

²⁶⁶ Source: <https://hoteltechreport.com/news/online-travel-agencies>

²⁶⁷ Source: <https://www.travelweekly.com/Travel-News/Hotel-News/Hotels-direct-bookings-making-up-ground-on-OTAs>

²⁶⁸ Source: <https://www.investopedia.com/ask/answers/041315/how-much-revenue-airline-industry-comes-business-travelers-compared-leisure-travelers.asp>

²⁶⁹ Proprietary research on U.S. travel industry in 2020.

²⁷⁰ Source: <https://www.phocuswire.com/phocuswright-ota-market-excitement>

²⁷¹ Source: <https://hotelreader.com/list-of-online-travel-agencies/>

²⁷² Source: <http://ir.tripadvisor.com/secfiling.cfm?filingID=1564590-16-12862>

²⁷³ Source: <https://a16z.com/marketplace-100/>

²⁷⁴ Source: <https://www.statista.com/statistics/250577/domestic-market-share-of-leading-us-airlines/>

²⁷⁵ Via the company's 10-K filing at: http://investors.southwest.com/~media/Files/S/Southwest-IR/LUV_2020_Annual%20Report_.pdf

²⁷⁶ The company 10-Ks reviewed reported 2020 passenger revenue as follows: American Airlines: \$17.3 billion, Southwest Airlines \$7.6 billion, Delta Airlines \$12.8 billion, and United Airlines \$11.8 billion.



Endnotes (cont'd)

²⁷⁷ Source: <https://www.statista.com/statistics/1170216/hotel-and-motel-industry-market-size-us/>

²⁷⁸ Source: <https://www.travelweekly.com/Travel-News/Hotel-News/Hotels-direct-bookings-making-up-ground-on-OTAs>

²⁷⁹ From Expedia's 10-K filing: 2019 global revenue \$12.1 billion. 2020 global revenue was \$5.2 billion. Also reported in the 10-K were 19,100 employees across more than 50 countries. In our 2016 report we ascribed 56% of revenues to the U.S. and used same percent for employees. Therefore 56% of 19,100 is 10,696 and 56% of \$5.2 billion is \$2.9 billion.

²⁸⁰ From the Booking Holdings 10-K: 2019 global revenue was \$15 billion, of which the U.S. was 10%, or \$1.5 billion. In 2020 global revenue was \$6.8 billion and the U.S. accounted for \$783 million with 3,400 U.S. employees.

²⁸¹ From TripAdvisor's 10-k filing: <https://ir.tripadvisor.com/static-files/c7f9a2d6-a737-4971-8d27-851a69c20d9b>

²⁸² All Other calculated at 10% based on this citation of Booking and Expedia representing 90% of the U.S. OTA market: <https://www.phocuswire.com/phocuswright-ota-market-excitement>

²⁸³ Via the company's 2020 10-K at: <https://investors.livenationentertainment.com/sec-filings/annual-reports/content/0001335258-21-000009/0001335258-21-000009.pdf>

²⁸⁴ Via the company's 2020 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001475115/986924a4-af12-4099-9b7d-f2afd80d6a86.pdf>

²⁸⁵ Proprietary research on U.S. credit card industry in 2020.

²⁸⁶ Source: <https://www.statista.com/topics/1176/online-advertising/>

²⁸⁷ Source: <https://backlinko.com/stripe-users>

²⁸⁸ Source: <https://www.forbes.com/sites/jeffkaufman/2021/04/07/plaids-134-billion-valuation-makes-its-founders-fintechs-newest-billionaires/?sh=7bd-2b0c32a22>

²⁸⁹ Source: <https://www.forbes.com/sites/jonathanponciano/2021/04/06/coinbase-posts-record-18-billion-revenue-as-crypto-market-shoots-past-2-trillion-direct-listing/?sh=1487b6f6b1c5>

²⁹⁰ Source: <https://qz.com/1954555/all-the-worlds-crypto-is-now-worth-more-than-1-trillion/>

²⁹¹ Source: <https://www.cnn.com/2021/04/06/cryptocurrency-market-cap-tops-2-trillion-for-the-first-time.html>

²⁹² Source: <https://www.coindesk.com/what-is-defi>

²⁹³ Source: <https://www.statista.com/statistics/893954/number-fintech-startups-by-region/>

²⁹⁴ Source: <https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/financial-services/deloitte-nl-fsi-fintech-report-1.pdf>

²⁹⁵ Revenue and employment figures as reported in 2020 10-K filing. Note that we have excluded the \$4.6 billion of income that Square reports from sale of bitcoin because it is required to report these sales as revenue.

²⁹⁶ Source: <https://www.businessofapps.com/data/coinbase-statistics/>



Endnotes (cont'd)

²⁹⁷ Source: <https://www.businessofapps.com/data/robinhood-statistics/>

²⁹⁸ Source: <https://www.forbes.com/sites/petercohan/2021/01/08/3-reasons-to-buy-sofi-stock-after-its-spac-ipo/?sh=6e8baa7e7593>

²⁹⁹ Source: <https://thefinancialbrand.com/106322/challenger-bank-chime-future-retail-banking-trend-mobile/>

³⁰⁰ Source: <https://www.marketwatch.com/story/fintech-unicorn-kabbage-ends-q3-with-nearly-100-in-revenue-amid-loan-growth-2019-10-23>

³⁰¹ Source: [https://en.wikipedia.org/wiki/Avant_\(company\)](https://en.wikipedia.org/wiki/Avant_(company))

³⁰² Via the company's 10-K filing.

³⁰³ Source: <https://www.forbes.com/sites/jeffkaufman/2021/04/07/plaids-134-billion-valuation-makes-its-founders-fintechs-newest-billionaires/?sh=7bd-2b0c32a22>

³⁰⁴ Source: <https://www.cbinsights.com/research/report/fintech-250-startups-most-promising/>

³⁰⁵ Source: <https://medicalfuturist.com/the-top-100-digital-health-companies-an-infographic/>

³⁰⁶ Source: <https://www.information-age.com/top-10-proptech-companies-aiming-change-property-market-123488802/>

³⁰⁷ Our estimate is based on the assumption that half of the global health tech market, or \$48.2 billion is based in the U.S. <https://www.grandviewresearch.com/industry-analysis/digital-health-market> and the legal tech market is 50% based in the U.S., assuming \$18 billion in revenue globally for 2020 and therefore \$9 billion for the U.S. <https://www.statista.com/statistics/1155852/legal-tech-market-revenue-worldwide/>

³⁰⁸ Source: <https://www.statista.com/statistics/910704/market-share-of-rideshare-companies-united-states/>

³⁰⁹ Source: <https://www.businessofapps.com/data/grubhub-statistics/>

³¹⁰ Source: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001792789/628c3275-56ed-4bc8-a246-20e7c40742ce.pdf>

³¹¹ Source: <https://www.businessofapps.com/data/instacart-statistics/>

³¹² Source: <https://www.wsj.com/graphics/can-you-guess-how-many-hotel-chains-equal-the-value-of-airbnb/>

³¹³ Source: <https://www.condorferries.co.uk/hotel-industry-statistics>

³¹⁴ Source: <https://www.stratosjets.com/blog/airbnb-statistics/>

³¹⁵ Source: <https://craft.co/sonder/locations>

³¹⁶ Source: <https://investors.upwork.com/static-files/3e021d73-76da-4840-af7e-a258c9c92888>

³¹⁷ Source: <https://www.cNBC.com/2018/04/30/the-8-highest-paying-side-hustles-on-fiverr.html>

³¹⁸ Source: <https://sec.report/Document/0001178913-21-000656/>



Endnotes (cont'd)

³¹⁹ Source: <https://www.linkedin.com/company/fiverr-com/>

³²⁰ Source: <https://oyelabs.com/taskrabbit-business-model/>

³²¹ Via the company's 10-K filing: The U.S. is \$6.08 billion of global revenue of \$11.14 billion. D&B Hoovers attributes 9,000 of 22,800 global employees to the U.S.

³²² Via the company's 10-K filing at <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001792789/628c3275-56ed-4bc8-a246-20e7c40742ce.pdf> U.S. revenues are reported as 99.6% of global revenues. We compute reported revenue and employee headcount accordingly.

³²³ Via the company's 10-K filing: Global revenue is \$2.36 billion. We attribute 98%, or \$2.31 billion to the U.S., as the company describes international revenues as 'non-material.' Of the 4,675 global employees reported we attribute 90% to the U.S., to account for personnel at corporate locations in Montreal, Canada, London, UK, Munich, Germany, and Minsk, Belarus.

³²⁴ Via the company's 10-K filing: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001594109/a2203d2c-b7e5-4275-bfc6-88988739880f.pdf>

³²⁵ The sources for the figures used in our estimates are <https://www.businessofapps.com/data/instacart-statistics/> and <https://craft.co/instacart>.

³²⁶ Based on the company's S-1 filing of November 2020 we take U.S. revenues of \$777.3 million and annualize them to \$1.036 billion. With offices in 24 cities and 2,390 global employees we estimate one third or 788, as U.S.-based.

³²⁷ Source for \$400 million revenue estimate for 2019: <https://www.cnbc.com/2021/02/20/how-francis-davidson-started-sonder-in-college-apartment.html>. Source for 869 employees: <https://www.linkedin.com/company/sonder-inc/about/>

³²⁸ Revenue figures as reported by segment in the company's 10-K at: <https://investors.upwork.com/static-files/3e021d73-76da-4840-af7e-a258c9c92888> Company employment figures are averaged from published reports from sites such as craft.co and owler.com.

³²⁹ Source: <https://sec.report/Document/0001178913-21-000656/>

³³⁰ All Other is calculated at 10% of firms analyzed in this section (10% of \$16.125 billion in revenue and 23,970 employees).

³³¹ Source: <https://www.statista.com/topics/4891/gig-economy-in-the-us/>

³³² For example Fiverr's third-party research report on freelancing in the U.S. at https://npm-assets.fiverrcdn.com/assets/fiverr-private/freelance_impact/freelance-economy-2021.681d2b6.pdf and Upwork's third-party report on freelancing in the U.S. at <https://www.upwork.com/i/freelance-forward>

³³³ Source: <https://www.earnest.com/blog/sharing-economy-income-data/>

³³⁴ Among the third-party research reports and data consulted were Fiverr's Freelance Economic Impact Report at <https://www.fiverr.com/freelance-impact>, Uber's Economic Impacts in the U.S. report at <https://drive.google.com/file/d/1P6HMbPc8T91Y8NIYyFGv8NQS9g4ckAq9/view>, Upwork's research on the freelance worker economy conducted by Edelman Intelligence in 2020 at <https://www.upwork.com/documents/freelance-forward-2020>, and Earnest.com's Sharing Economy Wage Data at <https://www.earnest.com/blog/sharing-economy-income-data/>.

³³⁵ Source: <https://www.ssa.gov/oact/cola/AWI.html>

³³⁶ "How Much Are People Making From The Sharing Economy" Report, Earnest.com, March 31st, 2020. <https://www.earnest.com/blog/sharing-economy-income-data/>. Methodology used: "We looked at anonymized data from tens of thousands of loan applicants to see how much people are earning on



Endnotes (cont'd)

side-gig platforms and how these platforms stack up against each other. We looked at a span of data accounting for just over two years, and for each worker, we analyzed a pay period of between one and 27 months. We do not know how many hours of work the income represents for each platform, as each one has a unique pricing and commission structure.”

³³⁷ There are 2 types of Amazon drivers: Amazon Flex drivers, who are contractors, and Delivery Service Partner (DSP) drivers. DSPs are employed by fleet operators and have benefits and full-time work. Flex drivers are part-time contractors. We estimate Flex drivers work at 40% capacity based on discussions on Reddit and articles such as <https://gridwise.io/everything-you-need-to-know-about-amazon-flex>. We also consulted sources such as <https://www.amazondelivers.jobs/about/driver-jobs/> and https://www.reddit.com/r/AmazonDSPDrivers/comments/jn029v/why_are_there_dsps/

³³⁸ “How Much Are People Making From The Sharing Economy” Report, Earnest.com, March 31st, 2020. loc cit.

³³⁹ “How Much Are People Making From The Sharing Economy” Report, Earnest.com, March 31st, 2020. loc cit.

³⁴⁰ Fiverr number of buyers and sellers source: 830,000 sellers and more than 5.5 million buyers in 160 countries since inception in 2010 cited at: <https://www.sec.gov/Archives/edgar/data/1762301/000104746919003139/a2238508zf-1.htm>. Assuming the number of sellers grew linearly with time, then in the eleventh year the number of sellers would be 75,000. The revenue curve is approximately linear. Note that we attribute half of revenue and employment to the U.S. as per the SEC filing. Other sources consulted include Earnest.com report on sharing economy earnings (loc cit) and Fiverr’s freelance economic impact report, May 2021: <https://www.fiverr.com/freelance-impact>

³⁴¹ In 2019 Instacart reported 130,000 shoppers. As a result of COVID-19 that number surged to 500,000 shoppers by the end of 2020. <https://www.supermarketnews.com/online-retail/instacart-hire-300000-more-personal-shoppers>. By early 2021 cuts to shoppers occurred as COVID-19 shopping behaviors changed. <https://www.pymnts.com/news/delivery/2021/instacart-slashes-1900-jobs-citing-pivot-to-pickup-model/>. To account for COVID-19 impacts here, as we have done in other industries such as travel, we assume 440,000 shoppers for 2020.

³⁴² We anchor our estimates for this category as follows: We started by using available data on a single teaching platform, Udemy, to form a benchmark: The company reports 56,000 instructors in more than 65 languages at <https://about.udemy.com>. We factor in the following report of average Udemy instructor earnings of \$15 to \$30 per month while top instructors make more than \$2,000 per month. <https://www.instructorhq.com/blog/is-udemy-worth-the-effort> Our non-FTE global number is five times the Udemy figure, with the U.S. as half, based on the platforms surveyed at: <https://www.guru99.com/best-online-course-platforms.html> To estimate the average earnings per month across the variety of online instruction platforms we take the range of earnings cited above and assume it is distributed according to a power law with exponent 3. Therefore, the median is \$45.

³⁴³ We anchor our estimates for this category on one of the dominant platforms, Betterhelp, which reports 14,000 therapists at <https://www.betterhelp.com/advice/careers/all-about-online-counselor-jobs-making-a-career-of-online-therapy/> We also reviewed publicly available information on online counseling platforms such as Talkspace, TeenCounseling.com, and PrideCounseling.com along with the 10-K filing of Betterhelp’s parent company Teladoc at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001477449/9c1878a5-a67f-4655-a9f6-8b63e2e4665d.pdf> We base our estimate of total number of workers engaged in online therapy as three times the Betterhelp figure and estimate monthly averages based on online discussions on sites such as Reddit.

³⁴⁴ Our estimate is based on the Earnest.com Sharing Economy Report (loc cit) and a reported 140,000 taskers in 2020, of which 60% were millennials at: <https://oyelabs.com/taskrabbit-business-model/> We therefore assume TaskRabbit ‘tasking’ is odd job work for students and young people who may be working at one or more part-time jobs.

³⁴⁵ Our assumptions for the category of Uber and Lyft drivers are anchored on the Earnest.com Sharing Economy Report (loc cit), a review of company SEC filings, and discussion boards of drivers’ experiences and average earnings on sites such as Reddit.

³⁴⁶ See previous footnote.



Endnotes (cont'd)

³⁴⁷ Upwork's 10-K filing reports 60,861 workers in the U.S. in 2020: <https://investors.upwork.com/static-files/3e021d73-76da-4840-af7e-a258c9c92888>
We also consulted the discussion board area of Upwork's site where a sample of 2.1 million freelancers indicates that 7.6% earned more than \$100 and 91% earned 0: <https://community.upwork.com/t5/Freelancers/How-many-active-freelancers-here-Upwork-with-unlocked-profiles/td-p/582917> As Upwork freelancers tend to be more skilled than those of Fiverr, we increased the average monthly earnings by a factor of 3.

³⁴⁸ We add an additional 10% to our estimate for this category to account for freelance workers for smaller platforms such as Getaround, Sonder, and Catalant.

³⁴⁹ Source: <https://www.theinformation.com/articles/investments-in-creator-economy-startups-hit-2-billion-an-interview-with-homebrew-s-hunter-walk>
and <https://influencermarketinghub.com/creator-earnings-benchmark-report/>

³⁵⁰ Robert Shapiro and Siddhartha Aneja, "Taking Root: The Growth of America's New Creative Economy," <https://www.recreatecoalition.org/media-center/economic-research/>

³⁵¹ Yuanling Yuan and Josh Constine, "SignalFire's Creator Economy Market Map" 2020 <http://signalfire.com/blog/creator-economy/>

³⁵² Ollie Forsyth, "The Ultimate Guide to the Creator Economy," 6-5-2021 <https://www.antler.co/blog/the-ultimate-guide-to-the-creator-economy>

³⁵³ Source: <https://www.musicbusinessworldwide.com/files/2020/03/The-Independent-Artist-2020.03.14-vEXTERNAL.pdf>

³⁵⁴ Source: <https://kstatic.googleusercontent.com/files/e0c9e192232ef73e18a8ac1fcb0b84668bd16e36ae22d3586ba09408dfc3c852f5bdd3a54fd738f2ca983c8ce765c90dc26a565b7700ca8e6c80438dc462e8a5>

³⁵⁵ Kaya YuriEFF, "TI Creator Economy: Advertiser Spending on Influencers Nears \$4 Billion," paywalled.

³⁵⁶ Source: <https://techcrunch.com/2021/02/08/twitter-confirms-plans-to-experiment-with-new-models-like-subscriptions-in-2021/>

³⁵⁷ Source: <https://investor.snap.com/overview/default.aspx>

³⁵⁸ Source: <https://www.statista.com/statistics/257128/number-of-photo-messages-sent-by-snapchat-users-every-day/>

³⁵⁹ Source: <https://variety.com/2020/digital/news/snapchat-spotlight-pay-creators-1-million-daily-1234837976/>

³⁶⁰ Source: <https://newsroom.pinterest.com/en/300million>

³⁶¹ Source: https://s23.q4cdn.com/958601754/files/doc_financials/2020/q4/Pinterest-Q4-Shareholder-Letter.pdf

³⁶² Source: <https://digiday.com/media/brands-are-in-the-clubhouse-app/>

³⁶³ Source: <https://www.businessofapps.com/data/clubhouse-statistics/>

³⁶⁴ Source: <https://growjo.com/company/Triller>

³⁶⁵ Source: <https://techcrunch.com/2021/04/27/social-networking-app-for-women-peanut-adds-live-audio-rooms/>

³⁶⁶ Source: <https://www.theverge.com/2021/2/8/22272148/mark-cuban-fireside-podcast-app-launch-creator-conversations>



Endnotes (cont'd)

³⁶⁷ Via the company's 2020 10-K filing: \$3.72 billion in annual revenue, of which \$1.64 billion is separated out as international, therefore \$2.08 billion, or 56%, is in the U.S. 5,500 global full-time employees are reported across 32 offices in 19 countries. We use the same proportion of 56% to ascribe employment to U.S. locations to arrive at our estimate of 3,080.

³⁶⁸ Via the company's 2020 10-K filing: \$2.5 billion in annual revenue, of which \$1.65 billion is attributed to the North American segment. Using our benchmark of 90% of North American revenues as U.S., we therefore attribute \$1.48 billion to U.S. revenues. For employment we use the same formula, working from the 3,863 global FTEs in 20 locations across 11 countries to arrive at our estimate of 2,295 U.S. employees.

³⁶⁹ Via the company's 2020 10-K filing: \$1.4 billion of global revenue of \$1.69 billion, or 82%, is identified as in the U.S. The company has six offices in the U.S. and seven abroad and we estimate that most employees are U.S.-based, using the same proportion of U.S. to global applied to revenues, to arrive at our employment estimate of 2,087.

³⁷⁰ TikTok's U.S. monthly active users are estimated at 100 million according to Reuters. We apply the annual revenue and employment per user of Pinterest to estimate TikTok's annual U.S. revenue.

³⁷¹ Proprietary research on dating industry in the U.S. in 2020.

³⁷² Source: <https://www.prnewswire.com/news-releases/iac-and-match-group-complete-full-separation-301086627.html>

³⁷³ Proprietary research on dating industry in the U.S. in 2020.

³⁷⁴ Revenue estimate via the company's 2020 10-K filing. Employment estimate for 2020 via: <https://www.statista.com/statistics/1120171/number-of-full-time-match-group-employees/>

³⁷⁵ Source for revenue estimate via proprietary research on dating industry in the U.S. in 2020. Employment estimate based on benchmarking derived from analysis of competitors.

³⁷⁶ Via the company's 2020 10-K filing.

³⁷⁷ Valuations based on the top three firms (Match Group, eHarmony, and Spark Networks) constituting 46% of the market, as per proprietary research on dating industry in the U.S. in 2020, and the 'All Other' segment constituting 54%.

³⁷⁸ Proprietary research on online job sites in 2020.

³⁷⁹ Proprietary research on online job sites in 2020.

³⁸⁰ Source: <https://www.cnn.com/2021/04/27/microsoft-linkedin-topped-3-billion-in-ad-revenue-in-last-year.html>

³⁸¹ Proprietary research on online job sites in 2020.

³⁸² Source: <https://insidetalent.org/ziprecruiter-ai-and-the-future-of-job-boards/>

³⁸³ Revenue estimate is based on a report of U.S. industry-specific revenues in proprietary research on online job sites in 2020. Employment estimate is based on assumption of revenue of industry benchmark of \$500,000 of productivity per employee.

³⁸⁴ Revenue estimates based on proprietary research on online job sites in 2020 and revenue estimate based on industry benchmark.



Endnotes (cont'd)

³⁸⁵ Revenue estimates based on proprietary research on online job sites in 2020 and revenue estimate based on industry benchmark.

³⁸⁶ Via D&B Hoovers.

³⁸⁷ The 'All Other' estimate has been arrived at by assuming the U.S. accounts for approximately half of global figures for the industry reported in proprietary research on online job sites in 2020 employment estimate is based on \$225,000 productivity per employee for the smaller firms, to account for the significantly lower economies of scale compared to the dominant market players in the sector.

³⁸⁸ Source: <https://www.businesswire.com/news/home/20201119005662/en/Strong-Close-to-Fiscal-Year-as-UKG-Approaches-3-Billion-in-Revenue>

³⁸⁹ Source: <https://www.ukg.com/about-us>

³⁹⁰ Source: <https://www.forbes.com/sites/alisoncoleman/2020/02/11/seven-hr-tech-startups-transforming-a-very-human-industry/?sh=35ba2f60294f>

³⁹¹ Our revenue and employment estimate is based on an assumption of a few hundred businesses with per employee productivity of approximately \$200,000.

³⁹² Via the company's 2020 10-K: \$12.74 billion of \$14.6 billion global revenue is in the U.S. (87%). The same proportion is applied to employees. Therefore 87% of 58,000 employees globally equals 50,460 U.S. employees. We assume all revenue is internet dependent based on analysis of reporting segments in SEC filing that use the cloud and AI systems.

³⁹³ Via the company's 2020 10-K: \$3.25 billion of \$4.3 billion global revenue is in the U.S. 12,500 employees across 32 countries are reported. We take 9,375 of employee headcount as U.S., and as per industry analysis noted in footnote for ADP, we assume all business functions as internet dependent.

³⁹⁴ Via the company's 2020 10-K filing.

³⁹⁵ Source: D&B Hoovers and 10-K filings.

³⁹⁶ Via the company's 2020 10-K: \$842 million global revenue, of which \$579 million is in the U.S. (69%). We subtract 69% of \$110 million of 'Bureau' segment revenue, as non-internet dependent, therefore \$579 million minus \$76 million equals U.S. internet-dependent revenue of \$503 million. The company 10-K reports 4,197 employees in North America. We use the industry benchmark of 90% of North America as in the U.S. to arrive at a U.S. estimate of 3,777, which we reduce by 13% to account for the 13% of revenues (\$110 million of revenues in 'Bureau' segment as proportion of total company revenue of \$842 million equals 13%), to arrive our estimate of 3,487 for internet-dependent U.S. revenue.

³⁹⁷ Source: D&B Hoovers and corporate website at <https://www.ellucian.com/about-us> as it's a privately held company. D&B Hoovers report \$324 million in global revenues and 3,000 employees. Using a benchmark of U.S. revenues relative to global revenues and employment numbers we attribute half of the D&B Hoovers figures to the U.S., internet-dependent revenue and employment.

³⁹⁸ Source: <https://www.forbes.com/sites/pamdanziger/2021/02/05/amazons-third-party-marketplace-is-its-cash-cow-not-aws/?sh=52f78c6f21c0>

³⁹⁹ Source: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001018724/336d8745-ea82-40a5-9acc-1a89df23d0f3.pdf>

⁴⁰⁰ Source: <https://www.forbes.com/sites/pamdanziger/2021/02/05/amazons-third-party-marketplace-is-its-cash-cow-not-aws/?sh=52f78c6f21c0>

⁴⁰¹ Source: <https://www.statista.com/statistics/259782/third-party-seller-share-of-amazon-platform/>



Endnotes (cont'd)

⁴⁰² Source: <https://www.marketplacepulse.com/amazon/number-of-sellers>

⁴⁰³ Via the company's 2020 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001018724/336d8745-ea82-40a5-9acc-1a89df23d0f3.pdf>

⁴⁰⁴ Source: <https://www.cnn.com/2021/05/13/amazon-hiring-75000-more-workers-in-latest-job-spree.html>

⁴⁰⁵ From the company's 2020 10-K: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0000320193/7b5717ca-6222-48e6-801c-9ea28feef86.pdf>

⁴⁰⁶ Our calculation of U.S. revenue assumes the U.S. as 80% of The Americas (i.e. 80% of \$124.5 billion or \$99.6 billion). We use the same ratio of U.S. revenue to global (36%) to arrive at our estimate of 52,920 for U.S. employment.

⁴⁰⁷ Via the company's 2020 10-K at: https://abc.xyz/investor/static/pdf/20210203_alphabet_10K.pdf?cache=b44182d

⁴⁰⁸ Via the company's 2020 10-K at: https://abc.xyz/investor/static/pdf/20210203_alphabet_10K.pdf?cache=b44182d

⁴⁰⁹ Company site <https://about.google/locations/?region=north-america&office=mountain-view> indicates that 30 of the company's 70 offices are U.S.-based. We assume a slightly higher proportion than 30/70 (43%) of workers are U.S.-based due to larger facilities and headquartering in California. We therefore take 50% of the 135,301 global employees reported in the 10-K as U.S.-based.

⁴¹⁰ Source: <https://github.com/about>

⁴¹¹ Via the company's 2020 10-K at: <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001326801/4dd7fa7f-1a51-4ed9-b9df-7f42cc3321eb.pdf>

⁴¹² Source: www.statista.com/statistics/217348/US-broadband-internet-subscribers-by-cable-provider/

⁴¹³ Lillian Rizzo, "Inside Comcast's Plan to Become a Streaming Giant," The Wall Street Journal, June 23, 2021.

⁴¹⁴ Bivens, J., 2003. "Updated Employment Multipliers for the U.S. Economy." [EPI Working Paper No. 268](#).

⁴¹⁵ Hann, IH, Viswanathan, S., Koh, B. "[The Facebook App Economy](#)." Center for Digital Innovation, University of Maryland, 2011.

⁴¹⁶ Source: <https://www.statista.com/statistics/263591/gross-domestic-product-gdp-of-the-united-states/>

⁴¹⁷ Source: <https://www.statista.com/statistics/269959/employment-in-the-united-states/>

⁴¹⁸ Source: <https://www.reuters.com/technology/nft-sales-volume-surges-25-bln-2021-first-half-2021-07-05/>