United States International Trade Commission

Digital Trade in the U.S. and Global Economies, Part 1

Investigation No. 332-531
USITC Publication 4415
July 2013

U.S. International Trade Commission

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Abstract

Digital trade is defined in this report as commerce in products and services delivered via the Internet. This report provides information on the role of digital trade in the U.S. and global economies, describes notable barriers and impediments to digital trade, and outlines potential approaches for further assessing the role of digital trade in the U.S. economy. Products and services delivered via the Internet make up a growing segment of the U.S. economy. Internet technologies have also transformed how many goods and services in the economy are produced and delivered. Digital sales make up more than half of music industry revenue; the digital shares of sales for games, videos, and books are smaller, but growing quickly. U.S. exports of digitally enabled services (one measure of international digital trade) grew from $282.1 billion in 2007 to $356.1 billion in 2011, with exports exceeding imports every year. Studies that have quantified the economic contributions of the Internet have generally found that it has made significant contributions to U.S. output, employment, consumer welfare, trade, innovation, productivity, and corporate financial performance. Digital trade can help producers lower their operating costs and work more efficiently. Small and medium-sized enterprises especially benefit from having lower-cost access to a wider range of products, services, and markets. Consumers benefit by gaining greater access to information about products and prices and more convenient ways to shop. Among the most notable barriers and impediments to digital trade reported were localization barriers, data privacy and protection measures, intellectual property-related issues, online censorship, as well as impediments to digitally enabled trade.

Editor's note: A technical correction was made to the first sentence of the "Royalties and License Fees" section on page 4-7 of the report.

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ABBREVIATIONS AND ACRONYMS

AAP	Association of American Publishers
ABA	American Bankers Association
ACH	automated clearing house
APEC	Asia-Pacific Economic Cooperation
ATM	automated teller machine
B2B	business-to-business
B2C	business-to-consumer
BEA	Bureau of Economic Analysis (U.S. Department of Commerce)
BIM	building information modeling
BPM5	IMF Balance of Payments Manual, 5th Edition
BPM6	IMF Balance of Payments Manual, 6th Edition
bps	bits of data per second (a measure of Internet data transmission speed)
BRT	Business Roundtable
BSA	Business Software Alliance
CAD	computer-aided design
CAGR	compound annual growth rate
CCIA	Computer & Communications Industry Association
CD	compact disc
CDA	Communications Decency Act
CDT	Center for Democracy and Technology
Census	Census Bureau (U.S. Department of Commerce)
DMCA	Digital Millennium Copyright Act
DOC	U.S. Department of Commerce
DSL	digital subscriber lines
DVD	digital video disc or digital versatile disc
e-book	electronic book
e-commerce	electronic commerce
e-discovery	electronic discovery
e-sales	e-commerce retail transactions
EC	European Commission
ECIPE	European Center for International Political Economy
EDI	electronic data interchange
EHR	electronic health record
EU	European Union
FCC	U.S. Federal Communications Commission
FDI	foreign direct investment
FTA	free trade agreement
FTC	Federal Trade Commission
GDP	gross domestic product
GPS	global positioning system
HIPPA	Health Insurance Portability and Accountability Act
HVEC	high-value engineering center
IaaS	infrastructure-as-a-service
ICT	information and communications technology
IIPA	International Intellectual Property Alliance
IMF	International Monetary Fund
IP	Internet Protocol
IPR	Intellectual Property Rights
ISP	Internet service providers (and intermediaries)
IT	information technology

ABBREVIATIONS AND ACRONYMS—*Cont.*

ITA	International Trade Administration
ITIF	Information Technology & Innovation Foundation
ITU	International Telecommunications Union
IXP	Internet Exchange Point
gbps	gigabits per second (1,000,000,000 bps)
kbps	kilobits per second (1,000 bps)
M2M	machine-to-machine
mbps	megabits per second (1,000,000 bps)
MLPS	Multi-Level Protection Scheme
MOOCs	massive open online courses
MOUSA	majority-owned U.S. affiliate
MPAA	Motion Picture Association of America
NAICS	North America Industry Classification System
NFTC	National Foreign Trade Council
NTIA	National Telecommunications and Information Administration
OECD	Organisation for Economic Co-operation and Development
ONI	OpenNet Initiative
PaaS	platform-as-a-service
PC	personal computer (desktop or laptop computer)
PMA	preferential market access
POS	point of sale
RIAA	Recording Industry Association of America
RWB	Reporters Without Borders
SaaS	software-as-a-service
SBA	U.S. Small Business Administration
SME	small and medium-sized enterprise
SSIA	Software & Information Industry Association
TCP	Transmission Control Protocol
TMS	transportation management systems
TPMs	technological protection measures
TV	television
UC	unified communications (software)
UNCTAD	United Nations Conference on Trade and Development
USDOC	United States Department of Commerce
USITC	United States International Trade Commission
USMOFA	U.S. majority-owned affiliate
USTR	United States Trade Representative
VoIP	Voice over Internet Protocol
WCIT	World Conference on International Telecommunications
WHO	World Health Organization
Wi-Fi	Wireless Fidelity
WiMAX	Worldwide interoperability for microwave access (high-speed wireless digital communications standard)
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

GLOSSARY

app: Short for "application," i.e., a computer program designed to carry out a specific task. "App" tends to refer specifically to applications made for mobile devices such as smartphones, tablets, and other Internet-connected handheld devices.

backbone: The main data routes between the large, strategically interconnected networks and core routers on the Internet. It is made up of multiple redundant networks owned and managed by numerous companies and covering many countries. The first Internet backbone was implemented in the United States by the National Science Foundation in 1986. Backbone networks consist of hundreds of strands of fiber optic cable connecting major cities and countries, including submarine cables laid on the ocean floor.

backbone network: One of the many fiber optic networks that run between cities and countries.

bandwidth: The amount of data that can pass through a communication channel during one second; often measured as bits per second (bps).

Big Data: See data analytics.

bit: Short for "binary digit," the most basic unit of information in computing. A bit can have one of only two values, 0 or 1; this trait makes it easy to represent and use bits in computing hardware. All numbers and letters can be represented using bits.

bits per second (bps): The number of bits transmitted over data lines in 1 second. Used as a measure of data transmission speed.

broadband Internet access (broadband): High-speed access to the Internet. Definitions of broadband have evolved over the years as improvements in technology have led to faster connections to the Internet. Originally it was defined as Internet access that is always on and faster than the traditional dial-up access. Currently, access speeds advertised as broadband vary significantly depending on the particular type and level of service ordered; they may range from as low as 200 kilobits per second (kbps) to 30 megabits per second (mbps). Some recent offerings even include 50 to 100 mbps.

cable Internet access (cable): Often shortened to "cable Internet," this is a form of broadband Internet access that uses the cable television infrastructure. This setup allows cable operators to provide broadband using the same coaxial cables that deliver pictures and sound to television sets connected to cable. Cable TV networks and telecommunications networks are the two predominant forms of residential Internet access.

client: A computer that initiates a request for information.

cloud/cloud computing: The Internet, or accessing software and other information technologies via the Internet

cloud storage: A computing data storage and backup model in which data are stored and backed up on remote servers hosted by third parties (cloud storage service providers) on the Internet ("cloud") instead of on the user's computer. Users access their data via the Internet. With mobile Internet-connected devices such as smartphones and tablets users are able to access their data stored in the cloud from anywhere.

content: Information made available online, including music, videos, games, books and other publications, news, art, and other information. There is often a distinction between professional media content (online content provided by companies) and user-generated content (online content provided by individuals through their webpages, social networks, user reviews, or blog postings).

GLOSSARY—*Cont.*

data analytics: Analysis of the large and constantly changing sets of data generated by Internet-connected devices and by online activities such as e-commerce transactions, social network postings, and machine-generated activity logs. Analysis of these large data sets is seen as a way for companies, governments, and other institutions to better understand consumer behavior and improve the ways products and services are designed, developed, marketed, and delivered. Also known as "Big Data."

dial-up Internet access (dial-up): A form of Internet access that provides access to the Internet via copper telephone lines. Broadband Internet access has replaced dial-up in most of the United States and in many other countries.

digitally enabled industry sectors: Sectors for which digital information and communications technologies, including the Internet, play an important role in facilitating the design, development, production, marketing, and delivery of products and services.

digital industry: An industry that produces or provides the digital products and services described in this report.

digital intensity: The degree to which different industry sectors have adopted digital technologies. Several different metrics may be used to rank the digital intensity of different industry sectors, as discussed in chapter 3 of this report.

digital subscriber line (DSL): A form of broadband Internet access that transmits digital data over the wires of a local telephone network.

digital technology: The Internet and Internet-based technologies.

digital trade: Defined in this report as the delivery of products and services over either fixed-line or wireless digital networks. This definition includes U.S. domestic commercial activity as well as international trade. It excludes commerce in most physical goods, such as goods ordered online and physical goods that have a digital counterpart such as books and software, music, and movies sold on CDs or DVDs.

download/downloading: To transfer data to a local system from a remote system, or to initiate such a data transfer. Any type of computer data file may be downloaded, including email, music, movies, or others. Downloaded data files are typically stored on the user's computer or device for later use or access. However, downloaded data files are not usable until all of the data have been received. Downloading differs from the related concept of streaming (see "stream/streaming" below) in that in streaming, the data may be used while data transmission is still in progress. Streamed data is typically used immediately and not stored on the user's computer or device.

e-commerce: Transactions conducted over the Internet or using Internet technologies.

e-government: The use of information technologies such as the Internet by national, state, and local governments to deliver information and provide services, instead of delivering information or providing services in a government office.

e-sales: E-commerce retail transactions.

freemium: A business model in which base software, apps, or other downloaded content are available for free or at a minimal cost, but charging for additional content or features.

G8 countries: Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States.

gigabits per second (gbps): 1 billion bps (see bits per second).

GLOSSARY—*Cont.*

high-speed Internet access: See broadband.

infrastructure-as-a-service (IaaS): Cloud computing services that allow customers to obtain a complete computer infrastructure (such as hardware, storage, servers, data center space, or network components) on an outsourced basis from third-party providers accessed through a Web browser via the Internet.

Internet exchange point (IXP): A physical location where the networks of telecommunication carriers, ISPs, and other network companies can connect with each other.

Internet intermediaries: Firms that bring together or facilitate transactions on the Internet by giving access to, hosting, transmitting, and indexing content, products, and services originated by third parties.

Internet Protocol (IP): The primary network protocol (standard) used on the Internet. Data on an IP network is organized into packets. Each IP packet includes both a header (which specifies source, destination, and other information about the data) and the message data itself. IP is often used together with the Transport Control Protocol (TCP) and referred to interchangeably as TCP/IP. TCP breaks messages sent from one computer into packets, IP-tags each packet, and streams the packets onto the Internet, then reassembles the message at another computer.

Internet Protocol address (IP address): a numerical label assigned to each device (such as computers, printers, and routers) participating in a computer network that uses the Internet Protocol for communication.

Internet service provider (ISP): A company that provides an Internet connection to households and businesses.

Internet of Things: The network of devices (physical objects) connected to the Internet.

online: On or using the Internet.

packet: A small unit of digital information transmitted along Internet networks. Using TCP/IP, information sent from one computer (such as an email or a webpage) is broken into packets, transmitted via the Internet, and reassembled at another computer into the format of the original information (i.e., the email or webpage).

peer-to-peer (P2P): A file sharing technology that connects individual computer users to each other directly, without going through a server to retrieve content. To use this technology, users download and install an application that enables them to search for and download files on other users' computers.

platform-as-a-service (PaaS): Cloud computing services that allow consumers to create software and run applications through a Web browser via the Internet on a third-party remote server without having to maintain the hardware and software infrastructure the customer would otherwise need. The provider provides the networks, servers, storage and other services.

router: A device that routes packets across the Internet.

satellite Internet access (satellite): Just as satellites orbiting the earth provide necessary links for telephone and television service, they also increasingly are used to provide links for broadband services. Satellite broadband is another form of wireless broadband and is particularly useful for serving remote or sparsely populated areas.

server: A computer that provides data to other computers. It may provide data to systems on a local area network within a single office or building, or over the Internet. While any computer can be configured as a server, most large business use multiple rack-mountable computers designed specifically to be servers; rack mounting allows additional servers to be added to increase capacity.

GLOSSARY—*Cont.*

smart: Internet-enabled. Examples discussed in this report are smartphones and smart televisions.

smartphone: A mobile phone built on a mobile operating system. Smartphones have more advanced computing capability and Internet connectivity than cellphones, typically including advanced features such as an always-on Internet connection, WiFi connectivity, and the ability to access and use a large number of apps. Modern smartphones typically include high-resolution touchscreens and Web browsers that display standard webpages as well as mobile-optimized sites.

software-as-a-service (SaaS): Software that is owned, delivered, and managed remotely by one or more providers. Users access the software and its functions as a Web-based service, typically through a Web browser. Also referred to as "on-demand software" because a user does not need to have a copy of the software to use it; instead, the software is delivered on demand by the provider.

streaming: A way of receiving and delivering multimedia content in which the content is continuously received by and presented to an end user as it is being delivered by a provider. Content may include music; movies, television, and videos; radio broadcasts; games; financial data; and closed-caption text. Streaming is made possible by the faster broadband connection speeds for the Internet.

TCP/IP: See Internet Protocol (IP).

telemedicine: The delivery of healthcare services from a distance via the Internet.

Transport Control Protocol (TCP): See Internet Protocol (IP).

Virtualization: Software implementations of computers that execute programs exactly mirroring the execution of programs by physical machines.

Voice over Internet Protocol (VoIP): A technology that allows telephone calls and multimedia sessions to be transmitted over computer networks like the Internet. VoIP converts analog voice signals into digital data packets and supports real-time, two-way transmission of conversations using Internet Protocol (IP). VoIP is also referred to as IP telephony, Internet telephony, and digital phone.

WiMAX: A high-speed wireless digital communications standard. Most widely known by this acronym, which stands for worldwide interoperability for microwave access.

wireless broadband (wireless): Broadband service delivered without use of wires or cables to transmit the signals. Currently, wireless broadband technologies are referred to as third generation (3G), fourth generation (4G), and Long Term Evolution (LTE). Wireless service is widely available from mobile broadband service providers, including mobile phone companies and others. Accessing mobile wireless broadband services requires a special antenna that plugs into or is built into a user's computer, smartphone, tablet, or e-book reader

Wireless Fidelity (Wi-Fi): A short-range wireless transmission technology often used in conjunction with a customer's DSL or cable modem service to connect end-user devices to the Internet without installing additional inside wiring. (Examples of end-user devices include personal computers, smartphones, tablets, gaming consoles, and set-top boxes.) The devices wirelessly connect to a base station; the actual Internet connection to the service provider is made via the base station, using the customer's DSL or cable modem service.

Executive Summary

The Internet has become an important element of modern economic infrastructure, fundamentally changing how people interact; how consumers shop; how products and services are designed, developed, marketed, and delivered; and how businesses operate and interact with one another. Digital trade—commerce in products and services delivered via the Internet—is increasing as a direct result of the widespread use of the Internet and Internet-based technologies. The increase in digital trade is having a significant impact on the U.S. and global economies. In this report, digital trade refers both to U.S. domestic commercial activity and to international trade in products and services delivered via the Internet.

Digital trade is a challenging topic for study. There is no standard or generally accepted definition for "digital trade." Moreover, there are significant shortcomings in the available data related to the value of digital trade, and information on data flows (another possible way to measure digital trade) is only beginning to be collected. This report will address these issues as it outlines U.S. and global digital trade activities.

This is the first of two reports prepared by the U.S. International Trade Commission (Commission) on digital trade. The second report, *Digital Trade in the U.S. and Global Economies, Part 2* (hereafter *Digital Trade 2*), will be completed in July 2014. Key findings from this investigation and an overview of report highlights follow below.

Key Findings

Digital trade benefits producers and consumers. Products and services delivered via the Internet make up a growing segment of the U.S. economy. These products and services are changing the way people and businesses interact with information and communicate with one another. The Internet and Internet technologies (also referred to as digital technologies in this report) benefit producers through improved logistics management, more efficient supply chain management, lower production costs, and improved efficiency in their business operations. Small and medium-sized enterprises (SMEs), in particular, benefit from having lower-cost access to a wider range of products, services, and markets. Digital technologies benefit consumers through improved access to products and services, wider product choice, and new, more convenient channels for service delivery. Both producers and consumers can benefit from the development and application of new digital technologies as producers gain greater ability to supply goods and services tailored to customer preferences (table ES.1).

TABLE ES.1 Producers and consumers benefit from adopting digital technologies

Economic agent	Benefits from adopting digital technologies	Examples of the benefits
Producers	• Improved logistics management • More efficient supply chain management • Lower operating costs • More efficient business practices • Greater access to more markets	• Internet-based logistics services enable greater efficiencies in global supply chains and increases in e-commerce • Cloud computing allows firms to outsource computing hardware and software services, letting firms focus on their core business operations • Cloud computing allows data- and transaction-intensive industries to lower their costs • Networked enterprises create more efficient service delivery • Machine-to-machine communications and data analytics enable more efficient management of resources
Consumers	• Greater access to and knowledge of products • More product choices • Additional channels for service delivery	• Consumers like multichannel, 24/7 access to products, services, and information through a combination of traditional, online, and mobile services • Online search and reviews make it easier for consumers to research products, compare prices, and transact purchases
Producers and consumers	• Increased market intelligence • More and better interactions in the marketplace	• Producers use social media to gather feedback from consumers and to conduct market research • Data analytics help producers tailor products to customer preferences and price products more efficiently

Source: Compiled by USITC.

Many leading companies with a large online presence are expanding their footprints in all aspects of the U.S. economy. For example, Amazon, Apple, Facebook, Google, and Microsoft have all expanded both the range of online products and services they offer and the types of online economic activities they engage in. Companies are using a variety of business models to expand their business operations—operations which are increasingly overlapping. They are more and more likely to offer many different kinds of products and services, including communications, entertainment, social networking, information search/retrieval, productivity enhancement (via data storage and analysis, productivity-enhancing software, and logistics services), and e-commerce.

All types of online content are growing. However, as shown in table ES.2, there is considerable variation in the revenue shares attributable to online sales for traditional U.S. content-based businesses—the music, games, video, and book industries. At one end of the spectrum, the music industry is now a predominately digital industry; at the other end, digital books are a small (but rapidly growing) segment of the book-publishing industry.

TABLE ES.2 U.S. digital content revenues and share of total content industry revenue, 2012

Content industry	Digital revenue 2012 (billion $)	Total revenue 2012 (billion $)	Digital revenue/total (%)
Music	4.1	7.1	57
Games	5.9	14.8	40
Videos	5.4	18.0	30
Books	3.0	15.0	20

Sources: Compiled by the USITC from Friedlander, "News and Notes on 2012 RIAA Music Industry Shipment and Revenue Statistics" (accessed April 5, 2013); Orden, "Online Movie Sales Log Rare Increase," January 8, 2013; NPD Group, "Research Shows $14.80 Billion Spent on Video Game Content," February 6, 2013; Owen, "Ebooks Made Up 20% of the U.S. Consumer Book Industry," May 15, 2013. See table 2.4 for complete source references and additional information.

The economic effects of digital trade on the content industries are difficult to measure, and vary by sector. Key findings include:

- It is difficult to isolate the effects of digital trade on revenues and employment in the content industries overall because of confounding factors such as the 2008–09 economic downturn and changes in consumer preferences.

- For books, the publishing industry reports an increase in e-book sales, although revenue from e-books still accounts for a small share of total books sales.

- For music, games, and videos, the share of digital sales has rapidly increased over the last few years, at least partially offsetting declines in revenues from physical sales.

- The impact of digital trade on U.S. employment in content-related industries is also mixed. Employment declines have been most pronounced in the traditional publishing and sound-recording industries, while employment grew in sectors associated with Internet publishing and broadcasting, and Web search portals.

Social media, such as social networking and user review websites, are having widespread effects on the broader U.S. economy.

- The distinction between the social media and content industries is becoming increasingly blurred. Social media sites are integrating with content providers and becoming venues for discovering and sharing content as well as platforms for advertising and marketing.

- Retailers account for a large portion of the advertising revenues earned by social networking sites. One in eight ads on the Internet was reportedly "socially enabled" in 2012—meaning they allowed consumers to "like" or "follow" the brands or products on social networks.

Internet technologies such as cloud computing are transforming the provision of information and communications technology (ICT) services.

- Companies are increasingly outsourcing their use of ICT products and services (such as software services, data processing and storage, and ICT management) to Internet-based platforms—known as the cloud. Cloud services allow firms, particularly SMEs, to benefit from no longer having to make costly investments in ICT infrastructure and computing capacity.

Internet technologies have transformed how most other goods and services in the economy are produced and delivered. Different industries have adopted Internet technologies to varying degrees and in different ways, whether because their products are now sold online or because their production processes are moving to Internet technologies such as cloud computing, as shown in table ES.3. Businesses are increasingly using Internet technologies to communicate with customers in addition to, or in place of, face-to-face interaction. Moreover, the vast amounts of data generated and collected using Internet technologies are helping retailers and suppliers become more efficient. For example, retailers now regularly gather and analyze information on shopping patterns, demographic traits, and customer transactions to better understand customer preferences and to develop and target personalized offerings.

TABLE ES.3 Internet technologies are changing how services are produced and delivered

Sector	How Internet technologies are used	Examples of effects on services
Retailing	Technologies used by consumers and retailers are rapidly changing how retailing is done: • Consumers are increasingly using PCs, smartphones, and tablets to research and shop for products and services online. • Retailers are using digital technologies to gain efficiency in back-end operations, including business logistics and marketing to consumers on their mobile devices. • Internet and cloud-based financial payment systems are widely available.	Internet technologies have transformed all aspects of the retail sector, including marketing, distribution, sales, customer service, and payments. Internet technologies have led to explosive growth in e-commerce. Globally, an estimated $8 trillion of sales is transacted annually through digital channels. The overwhelming majority of these sales are business-to-business transactions in the manufacturing and wholesale distribution sectors. Internet- and cloud-based financial payment systems are challenging traditional payment methods for both e-commerce and brick-and-mortar stores.
Express delivery	Digitally integrated software and devices now permeate this sector: • Transportation management systems optimize the flow of goods (by sea, air, and land) through manufacturing and retail supply chains. • Electronic data interchange allows intra- and intercompany computer-to-computer transmissions of business information. • Tracking technologies—such as vehicles fitted with computers, GPS, and handheld Internet-connected devices—can provide real-time supply chain information.	Logistics involves a range of related activities focused on the efficient movement of intermediate and finished products and services. Internet technologies including integrated logistics systems and networks are the crucial technologies that allow express delivery to move tens of millions of packages quickly and accurately each day to most points across the globe.
Financial services	Online services offer customers information about company products and services, give customers access to their account information, and allow customers to conduct transactions.	Online banking, brokerage, and other financial services have become fairly common, transforming services that used to be delivered only on a face-to-face basis to services that can be offered with greater customer convenience.
Professional services	Professional service products, such as legal briefs, consulting reports, or architectural and engineering designs, can easily be digitized and transmitted over the Internet. They account for a growing share of international trade.	Digital technology is transforming the way professional services are produced, greatly increasing productivity, lowering costs, and broadening the scope and speed of delivery. Whereas professional services traditionally have been provided in person, digital technology is eliminating geographic limitations, so that many professional services can be produced and transmitted from any digitally connected location on the globe.
Healthcare	Internet and cloud technologies are increasingly being used in a variety of healthcare applications, such as telemedicine, electronic health records management, diagnostic services, health information portals, records storage, data processing and sharing, e-referrals and e-prescriptions, and medical transcription.	Internet technologies are changing the way healthcare is delivered and are transforming the patient-provider-insurer relationship as a result. A major benefit is that they address two important sources of inefficiency: delivery fragmentation and poor transfer of information. The new technologies offer more efficient management of information and foster more effective communication between all parties involved.
Education	Online courses can be accessed using PCs or Internet-connected mobile devices. Other educational resources are widely available on the Internet.	Massive open online courses (MOOCs)—free, university-level online courses offered on specialized websites—are one recent Internet-related innovation in the education sector. MOOCs received a surge of attention with the launch of several websites by some of the world's leading universities in 2011–12.

Source: Compiled by USITC.

International Trade and Investment in Digital Trade-related Industries

Digital trade in the U.S. and global economies is expanding. Digital trade continues to grow both in the U.S. economy and globally as part of the broader transformation in global economic activity associated with the Internet. Available data indicate that a further increase in international digital trade is probable, with the United States in the lead. U.S. exports of "digitally enabled services"[1] have exceeded imports in every year from 2007 through 2011, and the U.S. surplus has widened during this period.

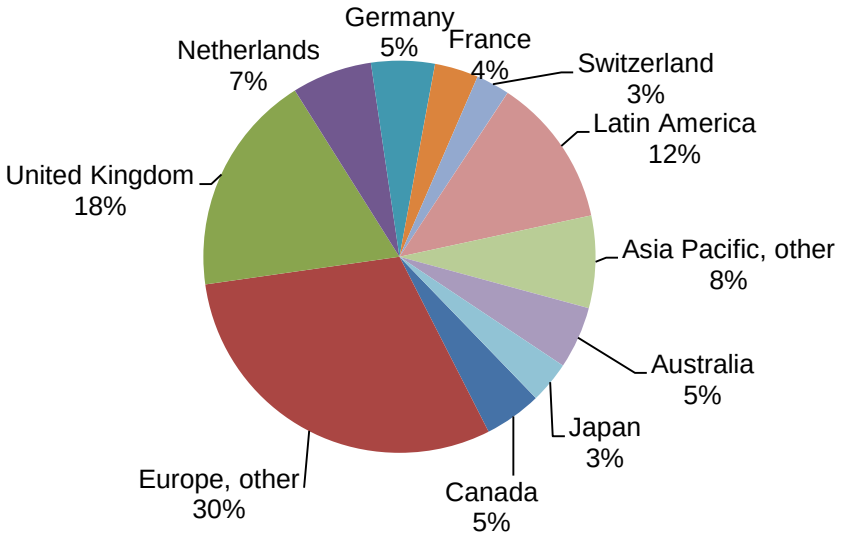
The most important regional trading partner for the United States is Europe. The leading U.S. export markets were the United Kingdom, Canada, and Ireland. U.S. imports come principally from the United Kingdom, Bermuda (partially due to its prominent role as an international offshore financial center, especially with respect to issuing international insurance), and Switzerland. This pattern reflects, in part, these trading partners' strong Internet infrastructures and specialization in financial services, an industry sector that has largely adopted the Internet for most cross-border transactions.

Business, professional, and technical services were the largest category of U.S. digitally enabled services exports and imports. While this is a very broad sector, many of this category's subsectors, such as computer and information services, are undoubtedly digitally intensive, and others can be assumed to be (e.g., architectural services).

Europe's position as the major U.S. trading partner in digital trade-related industries reflects the significant foreign direct investments made by U.S. information-sector companies to establish and expand operations in the region, which in turn generate an important share of these firms' global revenue. International trade in information services is best illustrated by the breakdown of sales of U.S. firms' foreign operations—that is, their majority-owned foreign affiliates (MOFAs) located around the world. Europe accounted for two-thirds of U.S. global sales in the information sector by U.S. companies' MOFAs in 2010 (latest available data) (figure ES.1). Software publishers generated the largest share of U.S. MOFA sales in the information sector in 2010 (latest available data), followed by (1) the group including Internet service providers (ISPs), Web search portals, Internet publishing and broadcasting, and (2) telecommunications (figure ES.2).

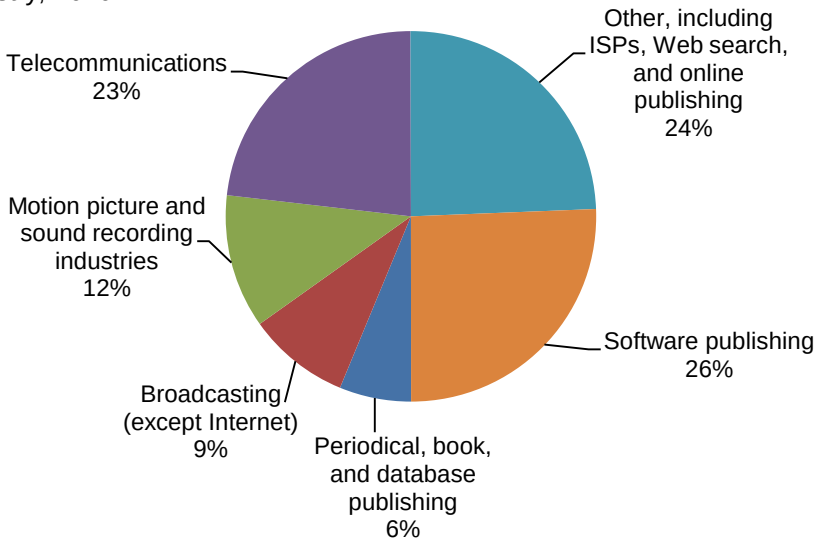
[1] This term is used by the provider of these data, the U.S. Department of Commerce (USDOC) Bureau of Economic Analysis (BEA). The BEA definition of "digitally enabled services" covers a significantly broader scope of industries than is defined under the scope of this investigation. The BEA definition is described further in chapter 4.

FIGURE ES.1 Information services supplied abroad by U.S. multinational corporations, through their MOFAs, by country, 2010



Source: USDOC, BEA.

FIGURE ES.2 Information services supplied by U.S. multinational corporations, through their MOFAs, by industry, 2010



Source: USDOC, BEA.

Notable Barriers and Impediments to Digital Trade

Industry representatives and experts identified notable barriers and impediments to digital trade. They in particular expressed concerns with respect to localization barriers, data privacy and protection, intellectual property-related issues, and online censorship, as well as impediments to digitally enabled trade (table ES.4).

TABLE ES.4 Notable barriers and impediments to digital trade identified by industry representatives during this investigation

Impediment or barrier	Description	Effects on the economy
Localization barriers	Barriers include policies that require the in-country location of data servers; policies that require local content or technologies; and government procurement preferences and standards that favor local companies.	Industry representatives noted that localization barriers generally reduce market access, increase the costs to firms, and result in suboptimal business processes.
Data privacy and protection	Approaches to data privacy and protection diverge from country to country. Particularly noteworthy are the differences in policy between two major trading partners, the United States and the European Union (EU).	Industry representatives and experts reported that these measures impose substantial costs and uncertainty on firms, especially SMEs. They stressed also the need to find common ground and interoperability in regulatory approaches.
Intellectual property-related concerns	Digital content providers and Internet intermediaries reported substantial, although different concerns. • Representatives of the content industries—including software, music, movies, books, and video games—identified Internet piracy as the single most important barrier to digital trade for their industries. • Internet intermediaries expressed concerns about unclear legal frameworks and being held liable for the infringing or illegal conduct of users of their systems.	Representatives of content providers and intermediaries reported substantial negative economic effects resulting from Internet piracy and unclear or overly broad legal liability, respectively.
Online censorship	Internet intermediaries and online content providers reported that online censorship is pervasive and growing.	Industry representatives reported that online censorship can substantially impede market access. They compared the blocking and filtering of online platforms and content to customs officials stopping all goods from a particular company at the border. They said that the negative economic effects can be considerable.
Traditional impediments	Border measures, such as complicated customs procedures and paperwork, can affect digitally enabled trade.	Industry representatives reported that customs duties and complicated document preparation and processing can increase the costs associated with small online retail transactions, making it more difficult to conduct online business, especially for SMEs.

Source: Compiled by USITC.

Industry participants also identified five affirmative principles they considered necessary to the continued growth and dynamism of digital trade:

- The free flow of data and information should be the norm, not the exception;
- Necessary restrictions should comply with existing trade disciplines—for example, nondiscrimination, national treatment, and transparency;
- Governments issuing regulations on privacy and data protection should strive for common ground and mutual recognition;
- Internet governance should be open to participation by private and public stakeholders and seek consensus through bottom-up and transparent processes; and
- Fostering Internet users' trust that Internet transactions will work as expected is fundamental for the firms and consumers who rely on digital trade.

Potential Approaches for Assessing the Contributions of Digital Trade to the U.S. Economy

To assess the contributions of digital trade to the U.S. economy, it is important to understand how the economy can benefit from the development and application of new Internet-based technologies. Studies that have quantified the economic contributions of the Internet use a variety of analytic methods and have reported a wide range of results. They generally have found that the Internet has made significant contributions to the U.S. economy, employment, consumer welfare, trade, innovation, productivity, and financial performance, as shown in table ES.5.

TABLE ES.5 Effects of digital trade on the economy as presented in existing economic literature

Indicator	Likely contributions of digital trade
Gross domestic product (GDP) and employment	Digital trade, and the industries responsible for products and services delivered via the Internet, contribute significantly to output and employment in the United States. This is the most common way to measure the contribution of the Internet to the economy.
Consumer welfare	Digital trade can create significant benefits for consumers—benefits that are not captured in expenditure-based estimates of its contribution to GDP. Besides supplying free content and services, the Internet has made it easier to compare prices; this development has sharpened competition among retailers, stimulated innovation among producers who are seeking to distinguish themselves from their rivals, and driven prices lower. It has increased convenience and the variety of products available to consumers.
Exports	Online platforms facilitate commerce, especially international trade in services.
Business practices	Digital trade is reshaping the ways that U.S. companies and their foreign competitors do business, especially SMEs.
Innovation and productivity	New products and services, or new ways of providing traditional products and services, are a hallmark of digital trade. Digital trade affects the U.S. economy through product innovation. In addition to its contribution to product innovation, digital trade can reduce costs and increase the productivity of firms.
Financial performance	Digital trade has enhanced the profitability of many U.S. firms. Digital leaders—firms with high information technology investment and transformation-oriented management able to implement technology-based change—have better industry-adjusted financial performance in terms of revenue generation, profitability, and market valuation.

Source: Compiled by USITC.

Table ES.6 summarizes the findings in eight of the most relevant studies of the economic effects of digital trade in the recent literature. Specific findings reflect a number of factors, including the type of the economic activity (sector-specific or economy-wide) and the type of Internet activity included (i.e., depending on the definition of "digital trade"). These studies focus more broadly on the economic role of the Internet or on specific ICT categories, rather than on digital trade as defined in this report. The studies come from many different sources, including academics, industry groups, federal agencies, and international agencies. They focus on estimates of the economic impact of the Internet rather than estimating the much broader economic impact of ICT. They vary in the economic effects that they try to estimate and the methods and data sources that they use. None of the studies address digital trade precisely as it is defined in the Commission's investigation, and none provide a comprehensive analytical framework that addresses all of the issues being considered in the current study.

A new analytic framework will be developed for *Digital Trade 2*, the follow-up to this study. The Commission will need to develop a framework that goes beyond those used in the existing economic literature. Key elements will include a survey of market participants as well as other analytical approaches that can complement and potentially corroborate the survey results. These additional approaches will likely include (1) statistical analysis using publicly available business and economic data to help quantify economic effects that are industry-wide and that spill over into other parts of the economy, and (2) simulation models to estimate the economy-wide effects of digital trade, including the effects on consumer welfare.

TABLE ES.6 Estimates of economic effects of digital trade in eight recent studies

Authors (publication year)	Economic effects examined	Estimates	Scope	Methods and data used
Borga and Koncz-Bruner (2011), U.S. Department of Commerce (USDOC), Bureau of Economic Analysis (BEA)	International trade	U.S. exports of ICT-enabled private services grew 193% between 1998 and 2010. The United States exported $324 billion in ICT-enabled services in 2010 and imported $208 billion.	ICT-enabled services sectors	Uses BEA statistics on U.S. trade in private services. Classifies certain categories of services as ICT-enabled.
Bughin et al. (2011), McKinsey & Associates	Revenues, productivity	The total annual value of Internet search technologies in the United States in 2009 was $242 billion, including $57–$67 billion in higher revenues for U.S. retailers and $49–$73 billion in search-enabled productivity gains.	Internet search	Uses various data sources and valuation calculations to estimate the value of Internet search for 11 different constituency groups.
Dean et al. (2012), Boston Consulting Group	SMEs	The Internet economy accounted for 4.7% of U.S. GDP in 2010. Consumers valued Internet access at $1,000–$3,500 per year, depending on their age. SMEs' growth rate was 15 percentage points higher if they made extensive use of the Internet.	All Internet	Uses an expenditure method to estimate the contribution of the Internet to GDP. Uses surveys to estimate the Internet's value to consumers and the impact on the growth of SMEs.
Deighton and Kornfeld (2012), Interactive Advertising Bureau	Employment	The consumer-facing layer of Internet industries added approximately 365,000 jobs between 2007 and 2011, while the consumer support services layer added approximately 245,000 jobs.	All Internet industries	Uses advertising revenues and a variety of other data sources to estimate the contribution of the advertising-supported Internet to the U.S. economy. Calculates a dollar figure for Internet industries and then applies an employment multiplier to calculate the number of indirect jobs.
Goolsbee and Klenow (2006)	Consumer welfare	The consumer gains from residential Internet usage were more than $3,000 per year for the median person in 2005.	Residential Internet use	Uses information on time spent online and expenditures from a survey. Uses an econometric model to calculate changes in equivalent variation, a measure of consumer welfare.
McKinsey Global Institute (2011)	GDP, employment, profitability	In 2009, the Internet contributed 3.8% of U.S. GDP, a $500 average increase in GDP per capita, 2.6 jobs created for every one destroyed, and $64 billion in increased consumer welfare. Also, Internet usage increased the profitability of SMEs by approximately 10%.	All Internet	Based on a global survey of more than 4,800 SMEs in the G8 countries, Korea, Sweden, Brazil, China, and India. Uses an expenditure method and data from the Organisation for Economic Co-operation and Development (OECD), adjusted for each sector, to estimate the contribution of the Internet to U.S. GDP.
Olarreaga et al. (2012), eBay	International trade, GDP	International trade costs are 60% lower for eBay transactions than for offline trade. There would be a 15.6% increase in real GDP if all trade were to go online.	A small share of on-line eBay transactions	Uses information on eBay transactions and total trade values to estimate a gravity model of the effect of international distance on trade.
USDOC, Census Bureau (2012)	E-commerce	In 2010, e-commerce accounted for 46.4% of the shipments of U.S. manufacturers and 24.6% of wholesalers' shipments.	All of the domestic and international shipments of U.S. establishments	Uses Census Bureau data collected in an annual survey of firms.

Source: Compiled by USITC.

Note: The G8 countries are Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States.

About This Report

As noted, this is the first of two reports requested by the U.S. Senate Committee on Finance (Committee) on digital trade in the U.S. and global economies. The Committee asked the Commission to provide information in this report on the role of digital trade in the U.S. and global economy, describe notable barriers and impediments to digital trade, and outline potential approaches for further assessing the role of digital trade and its linkages and contributions to the U.S. economy. This report is based on a review of available literature, publicly available business and economic data, and other public information. *Digital Trade 2* will use additional information sources—including a survey of U.S. firms in selected industries particularly involved in digital trade, as well as the application of other analytic approaches outlined in this report—to provide additional information on digital trade. *Digital Trade 2* is due to the Committee in July 2014.

This report examines digital trade both in the U.S. domestic economy and in the global economy. Table ES.7 shows the types of economic activities examined in this report.

TABLE ES.7 Digital trade: Economic activities examined in this report, by chapter

Chapter	Type of economic activity examined	Description
ch. 2	U.S. domestic commercial activity: Industries that deliver digital products and services in the U.S. economy	Examines digitally delivered content industries, including: • Music • Games (including full-format and mobile games, add-on content downloads, game subscriptions, social network games, and online multiplayer games) • Videos (including Internet TV, movies, and other videos) • Books (including e-books, digital course material, and audio books)
		Examines social media, including: • Social networking websites • User review websites
		Examines search engines, including: • General-purpose search engines • Specialized search engines
		Examines other digital products and services, including: • Software services, including mobile apps and software delivered via the cloud • Data services delivered via the cloud, including data processing and data storage • Communications services delivered via the Internet, including email, instant messaging, and Voice over Internet Protocol • Computing platform services delivered via the cloud
ch. 3	U.S. domestic commercial activity: Uses of Internet technologies in the broader U.S. economy	Examines selected services industries, including: • Retail and e-commerce • Financial services • Professional services • Healthcare services • Selected other services
ch. 4	International digital trade, FDI, and data flows	Examines a range of data, including: • U.S. exports and imports of services • U.S. MOFA sales • U.S. outbound and inbound FDI • OECD member country exports and imports of services • International data flows
ch. 5	International digital trade's legal and regulatory environment	Examines international trade barriers and impediments
ch. 6	U.S. domestic commercial activity, U.S. macroeconomic activity, and international trade	Assesses a variety of published studies

Source: Compiled by USITC.

CHAPTER 1
Introduction

The Internet plays an increasingly important role in U.S. domestic commerce and international trade. It touches nearly all sectors of the economy, and is directly or indirectly involved in most economic activities. It is difficult to imagine any modern firm, large or small, operating without the Internet and its related technologies.

"Digital trade" in this report means both U.S. domestic commerce and international trade in products and services delivered via the Internet. Digital trade has grown exponentially over the past two decades as part of the broader transformation in global economic activity associated with the Internet. In fact, the impact of the Internet on the global economy has been recognized as even more fundamental than that of the globalization of production and investment alone. [1] The Internet has changed—and continues to change—how people interact; how consumers shop; how products and services are designed, developed, marketed, and delivered; and how firms operate and interact with one another.[2]

There are many challenges to describing and measuring the role of digital trade in the domestic and global economies. First, the rapid evolution of Internet technologies and the ways they are used make it difficult to establish a standard definition of digital trade.[3] Further, widespread access to and use of the Internet has been made easier by mobile devices such as smartphones, tablets, gaming consoles, televisions, and TV set-top boxes (digital video recording devices) that are always connected to the Internet; this ease of use makes it increasingly difficult to distinguish digital trade from overall economic activity.[4] In addition, available statistics do not provide a good measure of international digital trade; the difficulty is that cross-border digital trade is fundamentally different from exports and imports of physical goods, because no identifiable item crosses a border through customs for counting and valuation.[5] Moreover, many commercially important aspects of the Internet, such as Web search engines and email services, are available for free, and the lack of a set price means that the value of these services can only be estimated.

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[1] Ruggiero, "Charting the Trade Routes of the Future," 1997; USDOC, *The Emerging Digital Economy*, 1999, 4–9; OECD, *Internet Economy Outlook, 2012*, 2012, 20. Some sources have compared the social and economic changes brought about by the Internet to the changes brought about through the introduction of electricity. Gustin, "Is Broadband Internet Access a Public Utility?" January 9, 2013; McKinsey Global Institute, *Internet Matters: Essays in Digital Transformation*, 2011, 2–3.

[2] Lehr, "Measuring the Internet: The Data Challenge," 2012, 5; Oxford Economics, *The New Digital Economy*, 2011, 11–14, 23–24; McKinsey Global Institute, *Internet Matters*, 2011, 1; World Economic Forum, *The Global Information Technology Report 2012*, April 4, 2012, 2013, 4.

[3] Terms such as "Internet economy," "digital economy," and "e-commerce" are equally challenging to define. For a discussion of terminology usage and definitions, see OECD, *Internet Economy Outlook 2012*, 2012, 27, note 1; OECD, *Guide to Measuring the Information Society 2011*, 2011, 72. See also Lehr, "Measuring the Internet: The Data Challenge," 2012, 7. A description of the evolution of the digital economy is provided in Oxford Economics, *The New Digital Economy*, 2011, 6–7.

[4] Lehr, "Measuring the Internet: The Data Challenge," 2012, 5; OECD, *Internet Economy Outlook*, 2012, 5, 20; World Economic Forum, *The Global Information Technology Report 2012*, 3–4, 28, note 10.

[5] The OECD has been in the forefront of establishing global standards for measuring the global digital economy in a comparable way across countries. The OECD recently reported that "there is no agreed comprehensive statistical framework of the information society," and further noted the difficulties it has encountered in establishing "definitions of e-commerce that are policy relevant and statistical feasible." OECD, *Guide to Measuring the Information Society 2011*, 2011, 12, 71.

Despite these challenges, this investigation was able to use existing, publicly available economic data, published literature, and other publicly available information to examine the role of digital trade in the U.S. economy and globally, to assess the extent to which digital trade facilitates and enables trade in other sectors, and to describe notable barriers and impediments to U.S. digital trade. This report concludes by outlining several approaches that could be used to more fully assess the linkages and contributions of digital trade to the U.S. economy in future work.

Objective and Approach

This is the first of two reports on digital trade requested by the U.S. Senate Committee on Finance (Committee). As requested, this report by the U.S. International Trade Commission (Commission or USITC) provides information to assist the Committee in better understanding the role of digital trade in the U.S. and global economies.[6] The Committee requested that the Commission provide its report in seven months and rely on publicly available information.

In accordance with the Committee's request, this report (1) describes U.S. digital trade in the context of the broader U.S. economy, including the extent to which digital trade facilitates and enables trade in other sectors of the U.S. economy; (2) examines U.S. and global digital trade and cross-border transactions related to such trade, including foreign direct investment (FDI); and (3) describes notable foreign barriers and impediments to U.S. digital trade. In addition, this report outlines potential approaches for assessing the linkages and contributions of digital trade to the U.S. economy that the Commission might use for a second report on digital trade, *Digital Trade in the U.S. and Global Economies, Part 2* (hereafter *Digital Trade 2*), requested by the Committee to be delivered in July 2014.

Scope

As noted above, digital trade is defined in this report as U.S. domestic commerce and international trade in products and services delivered via the Internet.[7] This definition was selected to allow this report to focus on products and services delivered via the Internet, and it excludes commerce in physical goods, such as goods ordered online and physical goods that have a digital counterpart. For example, digital trade as defined here includes digital books (e-books), downloaded software, and downloaded or streamed music and movies, but excludes hard-copy books and software, music, and movies sold on CDs or DVDs, no matter how they are sourced.

The Commission received input from the public on the definition of digital trade used in this investigation, both at the March 7, 2013 hearing, and in written submissions it received for this investigation. These public views, summarized in box 1.1, reflect a wide range of opinions about how digital trade should be defined or measured, as well as the scope of economic activity it should be considered to include. While this report measures

[6] See appendices A and B, respectively, for the request letter from the Committee and the *Federal Register* notice associated with this investigation.

[7] This definition includes products and services delivered over both fixed-line and mobile networks.

BOX 1.1 Public views on the definition of digital trade expressed at the public hearing and in written submissions for this investigation

The Commission's hearing reflected a variety of views on the appropriate definition of digital trade. As noted in the main text, for this report the Commission decided to define digital trade as products and services delivered via the Internet. Some industry representatives indicated that they understood the challenges the Commission faced in establishing a scope for digital trade suitable for constructing an analytic framework for this investigation.[a] Others commented that the requirement that products and services be delivered over digital networks was overly restrictive, and encouraged the Commission to use a broader definition that included digital products sold in both digital and physical form,[b] digitally facilitated trade in physical goods,[c] and all trade in products and services capable of being licensed, sold, distributed, or delivered over digital networks.[d] Others questioned whether the definition was wide enough to capture the value of all the diverse activities that occur over the Internet, including intracompany activities and virtual meetings,[e] or to fully reflect all of the channels that enable digital trade to take place.[f] A few others stated that the Commission should focus more on data flows[g] and should strive to capture the efficiency-enhancing value created by the Internet.[h] One stated that the Commission's definition was in some respects too broad because almost every product and service today has a component or associated service that is delivered over digital networks.[i] Finally, another individual stated that the definition of digital trade matters less than how the definition translates into trade policy instruments in the World Trade Organization or in trade agreements.[j]

A full summary of the positions of interested parties is provided in appendix D.

[a] USITC hearing transcript, March 7, 2013, 93 (testimony of Ed Gresser, Progressive Economy); USITC hearing transcript March 7, 2013, 270 (testimony of Edward J. Black, Computer & Communications Industry Association); USITC hearing transcript, March 7, 2013, 271 (testimony of David LeDuc, Software & Information Industry Association).

[b] USITC hearing transcript, March 7, 2013, 222–23, 271 (testimony of David J. Ohrenstein, BSA: The Software Alliance); written submission to the USITC, Association of American Publishers, March 14, 2013, 3; prehearing submission to the USITC, National Music Publishers' Association, February 28, 2012, 1.

[c] USITC hearing transcript, March 7, 2013, 268, 275 (testimony of Steven W. Stewart, IBM Corporation); post-hearing submission to the USITC, Entertainment Software Association, March 7, 2013, 2–3.

[d] USITC hearing transcript, March 7, 2013, 272 (testimony of Michael Schlesinger, International Intellectual Property Alliance).

[e] USITC hearing transcript, March 7, 2013, 94 (testimony of Martin Abrams, Center on Information Policy and Leadership).

[f] USITC hearing transcript, March 7, 2013, 95–96 (testimony of Jake Colvin, National Foreign Trade Council).

[g] USITC hearing transcript, March 7, 2013, 91–93, 130 (testimony of Michael Mandel, Progressive Policy Institute); post-hearing submission to the USITC, Michael Mandel, Progressive Policy Institute, March 14, 2013, 3; USITC hearing transcript, March 7, 2013, 98 (testimony of Joshua Meltzer, The Brookings Institution).

[h] Post-hearing submission to the USITC, Edward J. Black, Computer & Communications Industry Association, 2–3.

[i] Post-hearing submission to the USITC, Michael Mandel, Progressive Policy Institute, March 14, 2013, 3.

[j] USITC hearing transcript, March 7, 2013, 96 (testimony of Hosuk Lee-Makiyama, European Centre for International Political Economy).

digital trade primarily in terms of its monetary value, it also briefly discusses issues related to the measurement of digital trade using the volume of data flows. The Commission will further examine the definition and scope of digital trade, and ways to measure it, as part of the second study.

In order to provide a fuller description of the impact of the Internet on commercial activity in the U.S. and global economies, the report also outlines how firms in many industry sectors use the Internet and Internet technologies (also referred to as digital technologies) to produce and deliver products and services more efficiently, at lower cost, and with greater responsiveness to customer preferences. Examples of the ways digital technologies enhance productive efficiency and consumer welfare include the productivity gains made by manufacturing firms with better business process

management; the productivity improvements and market insights that firms across the economy gain by drawing on the vast amounts of data generated by e-commerce and social media interactions; the more efficient use of energy and other resources as a result of the huge increase in machine-to-machine (M2M) communications over the Internet; the benefits to small firms from leveraging the Internet to build a global presence; and the benefits to consumers of greater and more convenient access to online content and services via the Internet.

New and changing technologies mean that the activities that can be considered digital trade likely will continue to evolve and expand. For example, advances in 3-D printing—techniques making three-dimensional (3-D) solid objects using digital technologies apply information technology (IT) to additive manufacturing. Additive manufacturing is already used to make items such as medical implants, to produce plastic prototypes for engineers and designers, and to create an increasing number of other products. Despite the widespread potential ramifications of this technology, the Commission determined additive manufacturing to be too new, and data on its uses too limited, to be meaningfully included in the definition of digital trade used in this report.[8]

Information Sources

As requested by the Committee, this report is based on publicly available information, including a review of relevant literature, a public hearing, written submissions, fieldwork, and publicly available economic data. The Commission held a public hearing on March 7, 2013. Witnesses included representatives of academic institutions, nongovernmental organizations, industry, and trade associations.[9] Written submissions were provided by a diverse group of trade associations and industry representatives.[10] The Commission conducted approximately 50 interviews with industry and academic representatives in the Washington, DC, and San Francisco Bay areas.

Official data do not exist for digital trade as defined in this report. Services trade statistics collected by national governments, principally through surveys, are the primary means by which international digital trade is estimated. As a proxy for the United States' international digital trade, the Commission used economic statistics for international trade in service industries categorized as "digitally enabled services" by the Bureau of Economics (BEA) of the U.S. Department of Commerce (USDOC).[11] BEA data for digitally enabled services were used to examine trends in both U.S. cross-border trade and foreign affiliate sales. BEA data on U.S. FDI in specific digitally enabled services were largely limited to the broad "information industry" category.[12] The Commission also examined USDOC Census Bureau survey data on e-commerce in the United States. For cross-country comparisons, the Commission examined survey data on international trade in services compiled by the OECD (OECD) on its member countries. The Commission also examined the Bureau Van Dijk's Zephyr database for company merger and acquisition information and the Financial Times' fDiMarkets database for

[8] For information on 3-D printing, see *Bloomberg BusinessWeek*, "CEO Tech Guide: High-tech Machines," 2013; *Economist*, "Digital Fabrication," n.d. (accessed May 22, 2013).

[9] See appendix C for a list of hearing participants.

[10] See appendix D for summaries of positions of interested parties.

[11] BEA defines digitally enabled services as "those for which digital information and communications technologies (ICT) play an important role in facilitating cross-border trade in services." Borga and Koncz-Bruner, "Trends in Digitally-Enabled Trade in Services," 2012, 1. This definition is further discussed in chapter 4.

[12] The BEA definition of "information industry" is discussed in chapter 4.

information on companies' greenfield (new) investments around the world. In addition, the Commission has supplemented the analysis in this report with published business statistics compiled by companies, industry associations, business media, academic institutions, and nongovernmental or other independent organizations.

Organization of the Report

The contents of this report's remaining five chapters are briefly described below. Chapter 2 provides information on the main products and services that are estimated to make up digital trade in the U.S. economy. It examines digitally delivered content industries including music, games, videos, and books; social media, including social networking websites and user review websites; search engines; and other digital products and services, including software and mobile applications (apps), IT services, and communication services delivered via the Internet. Chapter 3 outlines how digital technologies have been adopted in other sectors of the economy, and highlights developments in selected services industries, including retail and e-commerce; financial services; professional services, including legal services and architectural and engineering services; and healthcare services. Both chapters 2 and 3 focus on U.S. domestic commercial activity, as shown in table 1.1, although activities of selected foreign firms operating in the U.S. market are also described.

Chapter 4 presents information on international trade and FDI in selected digitally enabled services. It uses available data to examine trends in U.S. cross-border services trade, sales by foreign affiliates of U.S. companies, and U.S. inward and outbound FDI. Information describing the outward FDI of leading U.S. providers of digital products and services is also presented. Finally, available international data are included to illustrate comparisons across countries pertaining to digital trade flows.

Chapter 5 describes notable barriers and impediments to international trade in digital trade-related industries. It discusses how each identified measure operates in practice, and lists particular countries or measures reported to be most problematic for firms. It also highlights affirmative principles that industry participants and experts consider essential to fostering the growth and dynamism of digital industries and the Internet.

Chapter 6 describes potential approaches to assessing the linkages and contributions of digital trade to the U.S. economy. It reviews relevant published studies on the economic significance of digital trade and discusses some of the data limitations that complicate a quantitative analysis of the economic effects of digital trade. This chapter concludes with a discussion of potential approaches the Commission might use in *Digital Trade 2* to quantify the value and potential growth of digital trade, as well as to provide insight into the broader role of digital trade in the U.S. economy.

TABLE 1.1 Digital trade: Economic activities examined in this report, by chapter

Chapter	Type of economic activity examined	Description
ch. 2	U.S. domestic commercial activity: Industries that deliver digital products and services in the U.S. economy	Examines digitally delivered content industries, including: • Music • Games (including full-format and mobile games, add-on content downloads, game subscriptions, social network games, and online multiplayer games) • Videos (including Internet TV, movies, and other videos) • Books (including e-books, digital course material, and audio books)
		Examines social media, including: • Social networking websites • User review websites
		Examines search engines, including: • General-purpose search engines • Specialized search engines
		Examines other digital products and services, including: • Software services, including mobile apps and software delivered via the cloud • Data services delivered via the cloud, including data processing and data storage • Communications services delivered via the Internet, including email, instant messaging, and Voice over Internet Protocol • Computing platform services delivered via the cloud
ch. 3	U.S. domestic commercial activity: Uses of Internet technologies in the broader U.S. economy	Examines selected services industries, including: • Retail and e-commerce • Financial services • Professional services • Healthcare services • Selected other services
ch. 4	International digital trade, FDI, and data flows	Examines a range of data, including: • U.S. exports and imports of services • U.S. MOFA sales • U.S. outbound and inbound FDI • OECD member country exports and imports of services • International data flows
ch. 5	International digital trade's legal and regulatory environment	Examines international trade barriers and impediments
ch. 6	U.S. domestic commercial activity, U.S. macroeconomic activity, and international trade	Assesses a variety of published studies

Source: Compiled by USITC.

Overview of the Evolution of the Internet and Its Role in Facilitating Digital Trade

Digital trade has increased rapidly in the United States and in many other countries as a result of the widespread availability of high-speed, or broadband, Internet access.[13] The remainder of this chapter describes the evolution of the Internet and its role in facilitating digital trade. The following section first describes the expansion and penetration of high-speed Internet access in the United States and globally; it then identifies selected key features of the current Internet communications infrastructure. More information about the Internet infrastructure appears in appendix E.

With Significantly Expanded Access, More People Are Using the Internet

Since the second half of the 20th century, the Internet has grown from a U.S. government research program to a core feature of modern economic infrastructure. The Internet was initially developed by U.S. Department of Defense researchers during the 1960s–1980s as a plan to connect the nation's research computers over telephone circuits. Commercial email services and dial-up Internet access began in the late 1980s, and full commercial use of the Internet became possible in 1991 (box 1.2). Since then, Internet access speeds have increased sharply, the number of Internet users worldwide has steadily risen, and mobile Internet use has expanded, leading to the widespread availability of Internet access and the incorporation of Internet-based activities into the daily lives of billions of people around the globe.[14]

By all measures, the number of Internet users has greatly increased in the United States and globally. Table 1.2 shows that the number of U.S. Internet users more than doubled from 2000 to 2012, from 95.4 million to 245.2 million. By 2012, an estimated 78.1 percent of the U.S. population had Internet access. Internet access spread rapidly in other countries as well. While only 1.8 percent of China's population had Internet access in 2000, an estimated 40.1 percent had access by 2012, with China accounting for almost one-fourth (22.4 percent) of the world's Internet users. The top five countries in terms of Internet users—China, the United States, India, Japan, and Brazil—together accounted for almost half (46.2 percent) of the world's Internet users in 2012. Another measure of Internet penetration is the number of unique Internet Protocol (IP) addresses in a country.[15] Of the approximately 700.0 million unique IP addresses globally, the United States ranks highest with nearly 146.9 million addresses, followed by China

[13] Definitions of broadband have evolved over the years as improvements in technology have led to faster connections to the Internet. In its U.S. National Broadband Plan of 2009, the Federal Communications Commission (FCC) defined broadband access as "Internet access that is always on and faster than the traditional dial-up access." FCC, "What Is Broadband?" n.d. (accessed April 26, 2013). More recently, the FCC has stated that "broadband speeds vary significantly depending on the particular type and level of service ordered and may range from as low as 200 kilobits per second (Kbps), or 200,000 bits per second, to 30 megabits per second (Mbps), or 30,000,000 bits per second. Some recent offerings even include 50 to 100 Mbps." FCC, "Guide: Getting Broadband," May 8, 2012.

[14] FCC, "The Internet: Looking Back," 2004; FCC, "History of Communications—Internet: Common Standards," November 21, 2005.

[15] An IP address is a numerical label assigned to each device (such as computers, printers, and routers) participating in a computer network that uses the Internet Protocol for communication.

BOX 1.2 Rapid evolution of the Internet

The Internet moved quickly from limited research use to widespread private and commercial use. In the 1950s the U.S. government was the primary owner of high-powered computers. Researchers working with the U.S. Department of Defense Advanced Research Project Agency (ARPA) tested the country's first computer network in 1965, and first tested connecting computers over telephone circuits between California and Utah in 1969 via a data transmission network called ARPANET.

By 1974, the Federal Communications Commission (FCC) had approved three applications for commercial carriers to add equipment to the transmission backbone—the main data transmission network—leased from the federal government to provide computer data services to government and academic computer users. Many improvements were made during this period, such as upgrades to the transmission backbone and the establishment of standards for email and domain names (such as .com, .gov, .edu, and .org). However, this network was known mostly to academics and researchers, government employees, and government contractors until the late 1980s.

The public gained Internet access in 1989. The country's first commercial email carriers (MCI Mail and CompuServe) began business in 1989, as well as the first public dial-up Internet service provider, The World Comes on Line. ARPANET was formally decommissioned in 1990. In 1991, all U.S. restrictions on commercial use of the Internet were lifted, and maintenance of the U.S. Internet backbone moved from the federal government to the private sector. By 1992, the Internet had become the most popular network linking researchers and educators at the post-secondary level throughout the world. The first Web browser, called WorldWideWeb, was invented in 1990; it was later renamed Nexus. The National Center for Supercomputing Applications (NCSA) introduced NCSA Mosaic, the first Web browser to use graphical features such as icons and bookmarks, in November 1993 and made it available for free, making it easier for nontechnical people to use the Internet. The Mosaic-based Netscape Navigator browser was launched in 1994; Microsoft's Internet Explorer browser, also Mosaic-influenced, was launched in 1995.

The Internet keeps getting faster. Internet speed is measured by the amount of time it takes for data to move between two computers. Faster speed allows more data to be transmitted and facilitates Internet capabilities such as voice services, video conferencing, remote desktop accessibility, and streaming music and movies.

The most basic unit of information in computing and telecommunications is the bit (short for binary digit). Internet speed is measured by the number of bits transmitted per second (bits per second, or bps). Use of high-speed data transmission lines, including fiber optic and satellite communications, allowed Internet data transmission rates to rise:

- ARPANET was first demonstrated in 1965 using 1,200 bps phone circuits.
- The 1969 ARPANET data transmission rate was about or 50 kilobits per second (kbps), or 50,000 bps.
- In 1984 ARPANET began to use dedicated data circuits with a data transmission rate of 1.5 megabits per second (mbps), or 1,500,000 bps.
- By 1991, the entire U.S. Internet backbone was connected using lines supporting a data transmission rate of 45 mbps, or 45,000,000 bps.
- In 1994, the U.S. Internet backbone was upgraded to 145 mbps, or 145,000,000 bps.
- In March 2011, Verizon Communications announced plans to begin upgrading its Internet backbone lines to 100 gigabits per second (gbps), or 100,000,000,000 bps.

U.S households get faster Internet access. Despite the increase in the speed of the Internet backbone, public access to the Internet was made at the significantly slower speeds connecting most U.S. households to the Internet, primarily via standard telephone lines. In 1993, when the NCSA Mosaic Web browser was introduced, affordable home Internet access was limited to 56 kbps dial-up modems, which converted digital computer signals into analog signals that could be sent over standard phone lines. More recently introduced products and services allow more widespread and affordable fully digital public broadband access to the Internet via digital subscriber lines (DSL), cable TV and satellite connections, fiber optic lines, and wireless (see appendix F for additional information on the Internet communications infrastructure). Average broadband speeds vary significantly, depending on the particular type and level of service ordered, and may range from 200 kbps to 30 mbps or higher. Verizon offers speeds of up to 300 mbps using fiber optic lines in some U.S. markets. In 2012, Google Fiber began deploying a broadband network in selected U.S. cities using fiber optic communication directly to homes with up to 100 gbps connection speeds; other providers have announced similar plans.

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Sources: FCC, "History of Communications," November 21, 2005; FCC, "The Internet: Looking Back," 2004; FCC, "Internet: Making the Connections," November 21, 2005; FCC, "Guide: Getting Broadband," May 8, 2012; NCSA, "About NCSA Mosaic," February 18, 2013; Google, "Google Fiber: About," 2012; Whitney, "Verizon to Install 100 Gigabit Network in U.S.," March 30, 2011.

TABLE 1.2 Top five Internet countries reflect worldwide growth in number of Internet users and Internet penetration from 2000–2012

	2000			2012			
Country	Population (millions)[a]	Internet users (millions)	Internet penetration (Internet users % of population)[b]	Population (millions)	Internet users (millions)	Internet penetration (Internet users % of population)	Internet users % of world Internet users
China	1,262.6	22.5	1.8	1,343.2	538.0	40.1	22.4
United States	282.2	95.4	33.8	313.8	245.2	78.1	10.2
India	1,053.9	5.0	0.5	1,205.1	137.0	11.4	5.7
Japan	126.9	47.1	37.3	127.4	101.2	79.5	4.2
Brazil	174.4	5.0	2.9	193.9	88.5	45.6	3.7
Top 5 combined	2,900.0	174.9	6.0	3,183.4	1,109.9	34.9	46.2
Rest of world	3,218.0	186.0	5.8	3,834.3	1,295.6	33.8	53.8
Total	6,118.0	361.0	5.9	7,017.8	2,405.5	34.3	100.0

Source: Miniwatts Marketing Group, "Top 20 Countries with the Highest Number of Internet Users, 2012," June 30, 2012.

[a]World Bank, http://data.worldbank.org/indicator/SP.POP.TOTL/countries (accessed April 28, 2013).
[b]USITC calculations.

(101.7 million), Japan (40.1 million), Germany (37.0 million), the United Kingdom (27.1 million), France (26.2 million), and Brazil (23.5 million).[16]

Broadband Internet Access Has Become the Standard

Digital trade has been made possible by the widespread availability of broadband.[17] Businesses, in the United States and globally, traditionally have been the main users of broadband because they are better able to afford the higher cost associated with faster Internet access.[18] Even small businesses have a higher broadband adoption rate than individual U.S. households.[19] For U.S. households, the adoption of broadband has been tied to the network installation activities of telecommunications and Internet companies, to increased broadband access via cable TV and satellite connections, and to the gradual decline in prices for popular broadband access services like digital subscriber lines (DSL).[20]

[16] Akami Technologies, *The State of the Internet, 4th Quarter 2012*, 2013, 11.
[17] This section discusses fixed-line broadband. Wireless broadband is discussed below.
[18] Gustin, "Is Broadband Internet Access a Public Utility?" January 9, 2013; McNicholas, "The Fastest Internet Speeds in the World," January 24, 2011. The FCC acknowledged the problem of extending affordable broadband to U.S. consumers, particularly those in rural areas, in its 2012 report. FCC, "Eighth Broadband Progress Report," August 21, 2012, 5–6.
[19] Based on an April 2010 survey, SBA reported that small businesses had an Internet adoption rate of 90 percent, higher than the 74 percent of adults with Internet access in the home and much higher than the 65 percent of adults who use their home Internet connection. SBA, Office of Advocacy, *The Impact of Broadband Speed and Price*, November 2010, 1.
[20] The FCC acknowledged the persistence of the problem of extending affordable broadband to U.S. consumers, particularly those in rural areas, in its 2012 report. FCC, "Eighth Broadband Progress Report," August 21, 2012, 5–6, 28.

The FCC estimated that of the total U.S. population of 315.9 million individuals, 94 percent had access to broadband by 2011.[21] Between 2002 and 2012, the FCC reported that the number of U.S. residential fixed-location (i.e., not including wireless) broadband connections[22] grew from 14 million connections to 82 million connections, or a 19 percent compound annual growth rate (CAGR).

A 2012 survey showed that as broadband access to the Internet rose, dial-up use fell. In June 2000, 34 percent of adult Americans with Internet access at home reported using dial-up access compared to just 3 percent using broadband. A steady increase in broadband access and decline in dial-up access meant that by March 2005, the share of Americans with home Internet access using broadband exceeded the share using dial-up for the first time. By December 2012, just 4 percent of adult Americans reported using dial-up, compared to 65 percent using broadband.[23] Box 1.3 describes the Internet infrastructure, how the Internet delivers information, and commonly used technologies to connect to the Internet.

Broadband technology and the increased availability of digital content—music, videos, games, and books—have, in turn, driven technological changes. The popularity of music and video content have arguably played a particularly important role in the evolution of digital commerce—driving demand for even faster broadband connections and fueling online searches, social networking, shopping, and entertainment.[24]

Broadband speeds are increasing globally. There are many ways to measure broadband speed and overall performance of a broadband connection. Measurements generally attempt to assess the performance users are most likely to encounter, which may be different from the speed and performance advertised.[25] While the United States generally ranks high in global comparisons,[26] many other countries offer even higher speeds. For example, in one commonly cited measure, the United States ranked 8th globally for average Internet connection speeds (uploading and downloading) in 2012 at 7.4 mbps, behind the Republic of Korea (Korea) (14.0 mbps), Japan (10.8 mbps), Hong Kong (9.3 mbps), Latvia (8.9 mbps), Switzerland (8.7 mbps), Netherlands (8.6 mbps), and the

[21] Data are for fixed-location (i.e., not including wireless) broadband. According to the FCC, of the 19 million Americans (6.0 percent of all Americans) without broadband access, 76 percent of those lived in rural areas; Americans residing on federally recognized tribal lands and in U.S. territories had even less access to broadband. FCC, "Eighth Broadband Progress Report," August 21, 2012, 5–6, 28.

[22] In this survey, the FCC defined broadband as Internet access connections faster than 200 kbps in at least one direction (sending or receiving data). FCC, "Internet Access Services, Status as of June 30, 2012," May 2013, 24, table 6.

[23] Pew Research Center, "Pew Internet & American Life Project: Trend Data (Adults): Broadband and Dial-up Adoption, 2000–2012," 2013. In its September 2009 survey, Pew found that 10 percent of U.S. families with teens reported using dial-up. Pew Research Center, "Pew Internet & American Life Project: Trend Data (Teens): Family with Teens by Type of Internet Access," May 2011.

[24] Moore, "Music: On the Road to Recovery," 2013; USITC hearing transcript, March 7, 2013 (testimony of Mitch Glazier, Motion Picture Association of America), 291.

[25] Factors affecting broadband speed and performance include whether data are being uploaded or downloaded, the sustainability of the Internet connection, and network congestion that can slow data transmission during peak usage hours. The FCC, for example, reports actual versus advertised speeds for both sustained data uploading and sustained data downloading during peak usage hours of the day. FCC, "Measuring Broadband America," February 2013, 8.

[26] According to one report, 99.6 percent of the U.S. population with Internet access had broadband access speeds in 2012. That report defined broadband speed as 768 kbps download and 200 kbps upload. USDOC, National Telecommunications and Information Administration, "National Broadband Map: Speed," June 30, 2012.

BOX 1.3 How the Internet works—Internet infrastructure and Internet technologies

The Internet is a collection of networks. Contrary to popular belief, the Internet is not a single network but instead a collection of millions of individual networks located around the world. These individual networks—referred to as local networks—are the basic building blocks of the Internet and include the networks of private companies, government agencies, universities, and other organizations. Such local networks are connected to the Internet by Internet service providers (ISPs). Individual Internet-connected devices, such as PCs, smartphones, tablets, gaming consoles, and TV set-top devices, become part of a network by establishing a connection to an ISP.

How connections to the Internet are made. ISPs provide a connection to the Internet, usually via copper wires or fiber optic cables running from individual homes and from buildings to the ISP's networking computers; these networking computers are usually housed in telecommunications companies' local neighborhood exchanges. Local ISPs, in turn, connect to the Internet via leased or owned fiber optic cables running from the local offices and nodes to the closest Internet exchange point (IXP). IXP facilities are located in or near virtually all major cities worldwide, as well as many medium and small ones.

How the Internet delivers information. The Internet works on a so-called client/server model. Under this model, one computer, the client, initiates contact with and requests information (for example, a webpage) from another computer, the server. When a user downloads a webpage, the client is the Internet browser on the user's PC or tablet, and the server is typically a large, powerful computer that is specifically designed to store data and deliver it to client computers upon request. Every device connected to the Internet has a unique identification number, or Internet Protocol (IP) address. The IP address identifies the device on the host network and provides an address on the network for data delivered to it.

Data for most common Internet activities are transmitted in the same way. Whether a user is downloading a Web page to view, sending an email, streaming music or videos, or making a Skype or Vonage telephone call, most of the data move across the Internet the same way. When a user creates and sends an email, for example, email software breaks the message into digital data packets, tags each packet with the IP address, and sends the packets onto the Internet network to the destination, where the packets are reassembled at the destination computer. In many cases, packets associated with a particular transmission (for example, a single email) travel via different paths to the destination, where they are received and placed in the correct order before delivery to the client.

Users can connect to the Internet using a variety of technologies. The most common methods include:

- Digital subscriber line (DSL): DSL services offer both data and voice transmission over lines used for traditional telephone calls at home.
- Cable TV and satellite: Cable TV companies offer broadband Internet services over the same infrastructure used to provide cable TV services. Satellite TV companies offer broadband Internet services over the same infrastructure used to provide satellite TV services.
- Workplace networks: Users may connect to workplace networks using either wired or wireless connections.
- Wireless broadband: the ever-greater availability of wireless broadband has led to a surge of people accessing the Internet using smartphones, tablets, and other mobile devices.
- Wireless fidelity (Wi-Fi): A very popular way to obtain wireless Internet services available either free or for a fee in public venues such as airports, coffee shops, hotels, libraries, and public transportation, including private vehicles, buses, trains, and, increasingly, airplanes. Wi-Fi is also used to provide mobile Internet access in homes and in the workplace for devices such as PCs, smartphones, tablets, gaming consoles, or TV set-top devices. Using Wi-Fi, a user's device wirelessly connects with a nearby (generally within a range of 65 feet, or about 20 meters, indoors although outdoor ranges may vary) base station. The base station (also known as an access point or router), in turn, uses an ISP to connect to the Internet.

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Sources: Bort, "Everything You Need to Know," March 29, 2013; Gralla, *How the Internet Works*, 7; Tyson, "How Internet Infrastructure Works," [2004].

Note: See appendix E for additional information on the Internet infrastructure.

Czech Republic (8.1 mbps).[27] In another index, based on download speeds, the United States ranked 33rd globally in early 2013 with an average download speed of

[27] Rankings were based on a composite indicator using average and average peak connection speeds. Akami Technologies, *The State of the Internet, 4th Quarter 2012*, 2013, 15.

17.63 mbps, compared to top-ranking Hong Kong's average download speed of 46.54 mbps.[28]

Wireless Broadband is Increasingly Popular

Wireless broadband has enabled digital trade to expand into almost all aspects of modern life. U.S. consumers are increasingly obtaining wireless broadband Internet access via mobile devices. In 2012, FCC survey data indicated that there were a total of 196.7 million U.S. broadband residential connections, with 82.2 million using fixed-line connections and 114.5 million using wireless.[29]

More people are accessing the Internet using a phone. A 2010 survey found that 86 percent of Americans owned a cellphone and 30 percent used the Internet on a handheld device such as a mobile phone.[30] A survey in early 2012 found that about half of U.S. cellphone owners surveyed reported using their phone to go online (up from about a third in 2009).[31] Moreover, consumers increasingly are using smartphones—cellphones built on a mobile operating system with advanced features including an always-on Internet connection, a color touch screen, and the ability to download apps to add functionality and access specialized online content.

Smartphone use is increasing globally. One recent analysis found that by the fourth quarter of 2012, the number of smartphone users globally was growing at the rate of 42 percent year on year.[32] According to another recent estimate, the number of smartphones shipped globally in 2013 is set to exceed shipments of basic cellphones, with China now accounting for more than half (55 percent) of the annual new smartphone sales.[33]

Wireless is especially driving demand for digital products and services. A 2013 survey found that portability and wireless broadband, particularly when accessed via tablets, were key drivers of the increase in U.S. demand for digital content. That survey reported that "the American population's voracious appetite for digitized information and entertainment continues unabated, creating a groundswell of consumers who move seamlessly between smartphones, tablets and laptops to consume digital content, often using multiple devices at the same time."[34]

[28] Ookla, "Net Index: Household Download Index," May 23, 2013.

[29] In this survey, the FCC defined broadband as Internet access connections faster than 200 kbps in at least one direction (sending or receiving data). FCC, "Internet Access Services, Status as of June 30, 2012," May 2013, 24, table 6.

[30] Horrigan, *Broadband Adoption and Use in America*, March 2010.

[31] Pew Research Center. "Pew Internet and American Life Project: Cell Internet Use," June 26, 2012, 2.

[32] Fourth quarter 2012 year-on-year growth in both China and the United States was 50 percent. Globally, an estimated 17 percent of mobile phone subscribers owned smartphones. The smartphone penetration rate (share of mobile phone subscribers owning smartphones) varies considerably. In China, 24 percent of mobile phone subscribers owned smartphones, whereas in the United States the figure was 48 percent as of the fourth quarter of 2012. Meeker, "Presentation," December 3, 2012, slide 7.

[33] NPD Displaysearch, "Global Smartphone Shipments to Surpass Basic," May 20, 2013.

[34] Deloitte, "Digital Omnivores Are on the Move," March 20, 2013.

The Number of Internet-connected Devices Is Increasing, Creating New Channels for Digital Trade

Digital trade is expanding as a result of the increasing number of Internet-connected devices and the near-ubiquity of the Internet. In addition to broadband access becoming widespread and a surge in the number of Internet-connected mobile phones, the number and variety of other Internet-connected devices is also increasing. One survey during the fourth quarter of 2012 found that U.S. homes had 425 million devices connected to the Internet via broadband, led by desktop and laptop computers, smartphones, tablets, gaming consoles, high-definition TVs, and streaming-media TV set-top boxes (such as digital video recording devices and DVD players).[35]

The recent explosion in the number of devices connected to the Internet (which, according to one study, rose between 2008 and 2009 to exceed the number of individuals connected to the Internet) Reporting from the 2013 Consumer Electronics Show, for example, highlighted the increasing number of consumer products making use of the Internet and its related technologies—including Internet-connected personal fitness monitors, Internet-connected cars, and Internet-connected home appliances.[36] Consumer, business, and industrial devices can be embedded with Internet-connected sensors that can be programmed to monitor operations and to transmit data reporting user behavior (for example, medical devices such as pacemakers) or to report whether the device needs maintenance or repair (or even to deliver maintenance and repair services).[37]

[35] NPD Group, "More Than 400 Million Devices Are Connected," January 2, 2013.

[36] Dewey, "CES 'Internet of Things,'" January 8, 2013; Higginbotham, "CES 2013: Connected Devices," January 3, 2013.

[37] Bort, "Everything You Need to Know," March 29, 2013.

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CHAPTER 2
Digital Trade in the U.S. Economy: Digitally Delivered Content, Social Media, Search Engines, and Other Digital Products and Services

This chapter describes digital trade—products and services delivered via the Internet—in the context of the broader U.S. economy. The chapter addresses four categories of digital trade: content delivered online, social media, search engines, and other digital products and services. The products and services included in each category are shown in table 2.1.

TABLE 2.1 Digital trade: Online products and services covered in this chapter

Digital trade by category	Products and services included in category
Digitally delivered content	• Music • Games (including full-format and mobile games, add-on content downloads, game subscriptions, social network games, and online multiplayer games) • Videos (including Internet television, movies, and other videos) • Books (including e-books, digital course material, and audio books)
Social media	• Social networking websites • User review websites
Search engines	• General-purpose search engines • Specialized search engines
Other digital products and services	• Software services, including mobile applications (apps) and software delivered via the cloud (i.e., via the Internet) • Data services delivered via the cloud, including data processing and data storage • Communications services delivered via the Internet, including email, instant messaging, and Voice over Internet Protocol (VoIP) • Computing platform services delivered via the cloud

Note: An overview of all of the economic activities covered in this report is provided in table 1.1.

The digital products and services discussed in this chapter fall broadly within the U.S. information sector as categorized in the North American Industry Classification System (NAICS).[1] This sector comprises establishments that produce and distribute information, provide the means to distribute these products and enable communications, and process data. The scope of this investigation covers only the online portion of this sector, although those online activities are discussed in the context of the broader sector.

[1] The NAICS is used by business and government in the United States, Canada, and Mexico to classify business establishments according to type of economic activity. The main components of NAICS category 51 (information sector) are the publishing industries, including software publishing; the motion picture and sound recording industries; the broadcasting industries; the telecommunications industries; Internet publishing and broadcasting and Web search portals; data processing industries; and the information services industries. Information and services delivered over the Internet account for some portion of this information sector, but are not separately categorized.

Expanding Footprints of Digital Industries

Digital products and services delivered via the Internet are a growing segment of the U.S. economy. Such products and services are changing the way people and businesses interact with information and communicate with one another. Digital products and services are part of a complementary digital ecosystem,[2] both relying on and driving the demand for broadband Internet access and Internet-enabled devices.

The leading companies with large online presences are increasing their footprints in all aspects of the wider economy. Their business models are expanding—and increasingly overlapping. As they broaden their business operations, the products and services they offer are increasingly likely to include some, if not most, of the following: communications services (such as email, voice, and instant messaging), entertainment, social networking, information search/retrieval, productivity enhancement (including data storage and analysis, productivity-enhancing software, and logistics services), and e-commerce.

Today, a single company is likely to be involved in several activities that were once distinct, but are now increasingly interconnected. These activities include the creation, production, or provision of online content and content aggregation; Internet-based platforms; cloud-based services and apps; network services; operating system (OS) software; and Internet-connected devices. For example, major companies with a significant online presence such as Amazon, Apple, Facebook, Google, and Microsoft have expanded both in the range of the online products and services they offer and in the types of online economic activities they engage in, as shown in figure 2.1. This activity has occurred as companies develop their own new products and services as well as through the acquisition of smaller companies. For example:

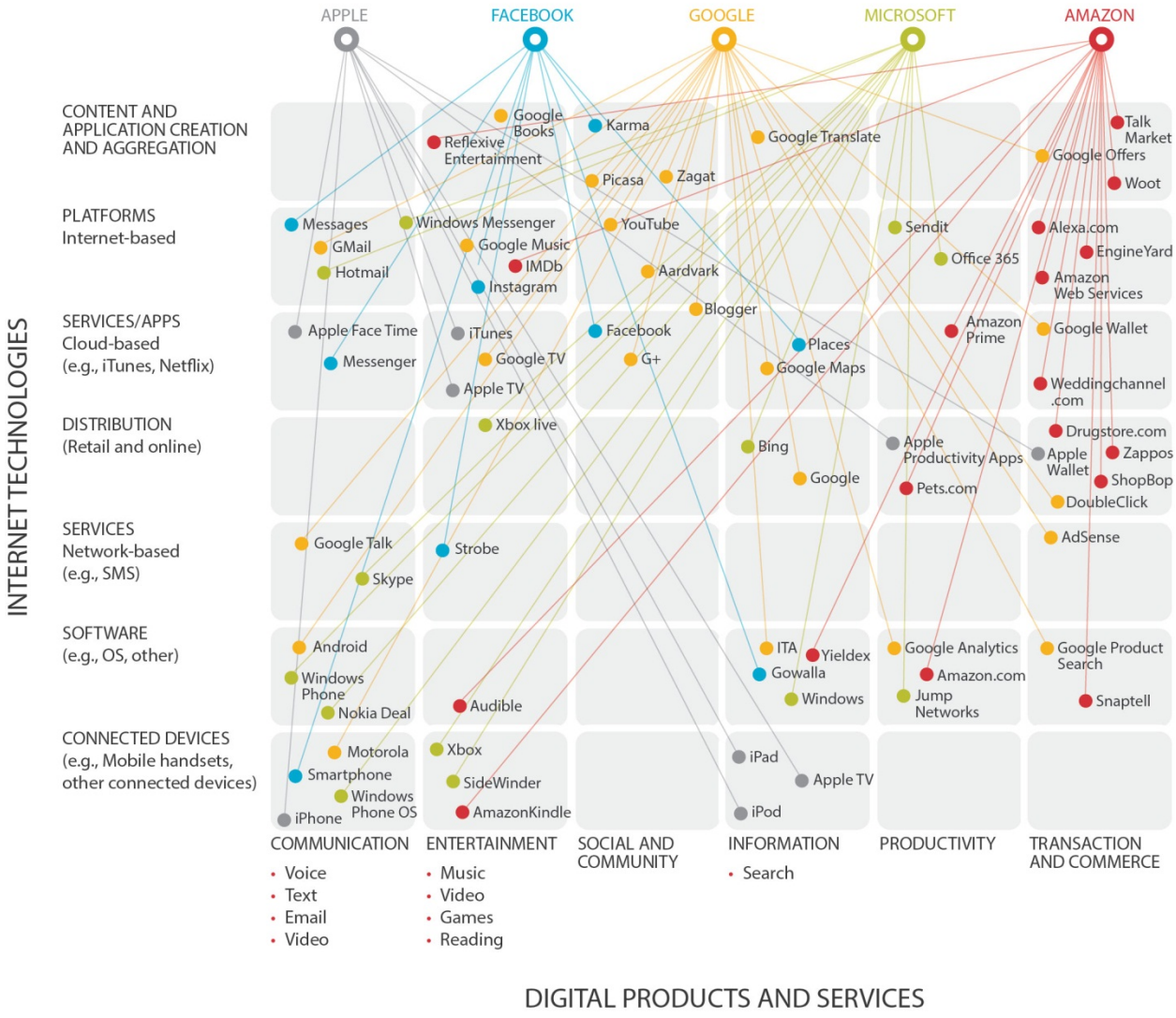
- Amazon was launched in 1994 as an online bookseller. Amazon currently offers a wide range of services for customers, sellers, enterprises, and content creators. Amazon is most known for its online store that sells a variety of physical goods, including books, consumer electronics, clothing, toys, household goods, and appliances. Amazon also sells its own e-book reader. Its digital products and services include digital and audio books; software, music, and movie downloading and media streaming; an app store; and online publishing services for authors, musicians, filmmakers, app developers, and others. Amazon also offers many Web and cloud computing services.[3] Notable Amazon acquisitions include Goodreads (a social reading website); Diapers.com and Zappos.com (online retailers); IMDb (a movie, TV, and celebrity database website); and Kiva Systems (a manufacturer of robotics systems for warehouses).[4]

[2] WEF, *Digital Ecosystem*, 2007.

[3] Amazon, "Amazon Web Services," 2013; Amazon.com, *Annual Report, 2012*, April 2013; Amazon, "History and Timeline," 2013.

[4] Amazon website, http://www.amazon.com/ (accessed June 15, 2013); Mills, "Amazon's Kiva Robot Acquisition," *Forbes*, March 23, 2012.

FIGURE 2.1 Expanding footprints of leading online firms



Source: Oliver Wyman, "A Money and Information Business: The State of the Financial Services Industry 2013," April 2013, 17.

- Apple was incorporated in 1976 as Apple Computer, Inc.,[5] originally selling mainly assembled PCs and an operating system for computer hobbyists.[6] Apple now designs, manufactures, and markets smartphones, tablets, PCs and

[5] "Computer" was dropped from the company's name in 2007 to reflect its new focus on consumer electronics after the introduction of the iPhone. Stonington, "Technology: Apple's Greatest Hits and Misses," n.d. (accessed May 30, 2013).

[6] To make a working computer, users still had to add a case, power supply transformers, power switch, keyboard, and video display. While the Apple I kit was of limited public appeal, the Apple II computer introduced in 1977 was fully assembled and designed for the mass market. Linzmayer, "30 Pivotal Moments in Apple's History," March 3, 2006.

accessories, and portable digital music players, and sells a variety of related software (including server, OS, application, and mapping software), peripherals, networking solutions, cloud services, and third-party online content and applications. Apple also sells and delivers online content (including music, movies, and books and other publications) and apps through its online stores. Notable Apple acquisitions include Siri Inc. (an app developer offering a voice-based digital personal assistant) and several mapping companies.[7]

- Facebook was incorporated in 2004 as a restricted-membership college website to help students get to know each other. Facebook has grown to become the leading U.S. social networking site that has a significant global presence. In addition to social networking, Facebook currently offers email, a chat and SMS service, a platform to help developers create social apps and websites, and an analytics platform to help advertisers track their performance. A recent notable Facebook acquisition was Instagram (a photo and video sharing website).[8]

- Google's origins date to a 1996 graduate school research project to create an Internet search engine. The company was incorporated in 1998. Google's current products and services include Internet search services, social networking, online content, and content access tools; online products and services, including a Web browser; email, voice, and text messaging services; mapping and geographic services; cloud storage services; advertising services; operating systems and platforms; and a variety of business-oriented products and services. Google has partnered with several IT hardware companies to develop consumer electronics, including smartphones, tablets, and Internet-connected glasses. Google also has an ongoing project to develop a national broadband network by installing fiber optics lines in communities in selected U.S. cities.[9] Notable Google acquisitions include Motorola Mobility (a manufacturer of telecommunications equipment including smartphones and tablets) and YouTube (a video sharing and viewing website).[10]

- Microsoft was founded in 1975 as a microcomputer operating system vendor.[11] Microsoft's current products and services include software (including server, OS, and application software as well as cloud-based software services); devices (including PC accessories, smartphones, tablets, and gaming consoles); Internet-based products and services (including a Web browser, email, Internet search, cloud storage, and a Web portal and content delivery site); servers; developers' products (including an online training and certification program); business and

[7] Linzmayer, "30 Pivotal Moments in Apple's History," March 3, 2006; Guglielmo, "Apple Acquisitions Are Few but Notable," *Fortune*, October 4, 2012.

[8] Facebook, *Annual Report, 2012*, January 2013; Associated Press, "Hits and Misses in Facebook History," May 1, 2013; Etherington, "Facebook Closes Instagram Acquisition," *Techcrunch*, September 6, 2012.

[9] Google, *Annual Report, 2012*, January 2013; Google, "Our History in Depth," n.d. (accessed May 24, 2013); Google, "Google Fiber: About," 2013.

[10] Google, "Google to Acquire Motorola Mobility," Press release, August 15, 2011; Google, "Google to Acquire YouTube," Press release, October 9, 2006.

[11] Microcomputers were early forms of PCs. The name "Microsoft" is a combination of the words "microcomputer" and "software." *Fortune*, "Bill Gates and Paul Allen Talk," October 2, 1995.

enterprise services and products; and online content, through a partnership with a national broadcasting network. One recent notable Microsoft acquisition was Skype (a VoIP service).[12]

Digitally Delivered Content

Digitally delivered content represents the online versions of traditional content, and includes Internet-delivered music, games, movies, TV, radio, and books.[13] Companies that provide such content to consumers may operate exclusively on the Internet or may also distribute traditional physical content; however, only the Internet-delivered portion is within the scope of this investigation.[14] An increasing share of content is being delivered over the Internet, though the share of, and effect on, physical sales varies by industry.

This section provides an overview of the economic effects of digital trade on U.S. content industries, focusing mainly on the online music, games, videos, and books industries. It includes discussions of the effects of online content on consumer expenditures and employment; describes different business models used in content industries; and highlights important trends in the growth of Internet delivery in the content industries.

Economic Effects of Digital Trade on U.S. Content Industries

It is difficult to isolate the effects of digital trade on revenues and employment in the content industries as a whole from the effects of confounding factors, such as the 2008–09 economic downturn, changes in consumer preferences, and others. Several content industries report declining physical sales in recent years, while online sales have grown—in some cases completely offsetting the declines in physical sales. However, in some cases online content may not be a substitute for physical content, but rather an inseparable complement. Particularly in the video game and TV industries, the content delivered online may be a component of the larger experience. One computer and communications industry report stated that, as a whole, the entertainment industry, including music, games, videos, and books, is "booming." That report points to more content choices for consumers and more opportunities for businesses and artists to make money as evidence of the health of the entertainment industry.[15]

[12] Microsoft, "Microsoft: Products," 2013; Microsoft, "Microsoft Officially Welcomes Skype," October 13, 2011.

[13] These examples are illustrative of traditional content industries that have a significant or growing online presence. Other parts of the publish industry, such as newspapers, magazines, and scientific periodicals, as well as the photographic industry, also derive increasing amounts of their revenue from online distribution.

[14] For example, a traditional broadcast radio station may also broadcast its programming over the Internet; the Internet, or online, portion would be within the scope of this report, but not the traditional broadcast. Similarly, a cable TV network may supplement programming over cable networks with the same programming available through a website; only the portion viewed via the website is within the scope. Amazon sells physical books as well as downloadable e-books online; only the e-books are within the scope of this report.

[15] Masnick and Ho, *The Sky Is Rising*, January 2012.

Online Content's Effects on U.S. Consumer Expenditures

Digital trade has increased U.S. consumers' access to a rapidly growing amount of online content. However, particularly in light of the 2008–09 economic downturn, slow economic recovery, and other factors, including lower prices for online content and increased piracy of copyrighted material, it is not clear that digital trade has led to a significant change in overall U.S. consumer spending on content in general, or specifically to an increase in consumer spending on online content.

Recent data show that overall average annual consumer spending on entertainment—both physical and online—decreased 1.2 percent from 2006 to 2011, while total average annual consumer expenditures increased 2.7 percent over the same period.[16] The decline in consumer spending on entertainment resulted in a decline in the share of consumers' annual expenditures accounted for by overall entertainment spending, from 4.1 percent in 2006 to 3.9 percent in 2011. While this overall decline may indicate that consumers are enjoying less entertainment, the fall in consumers' entertainment spending may also reflect the increased availability of online entertainment accessible at a lower cost and the proliferation of ad-supported free content. Also, the decline may reflect consumers' having easier access to pirated copyrighted online content—a substantial concern of the content industries, as reported by witnesses at the Commission's public hearing for this investigation.[17] Copyright issues are discussed further in chapter 5.

There is some evidence that online offerings have led to an increase in overall online content consumption. For example, according to one recent survey, 30 percent of those who have read electronic content—meaning books, magazines, newspapers, or journals in digital format—reported spending more time reading since the advent of digital content.[18] In general, people preferred reading e-books when they were traveling or commuting or when they wanted to get a book quickly, all these scenarios representing instances where reading might have been foregone in the absence of digital content. There may also be an analogous trend across many content industries. As noted in chapter 1, the widespread availability of high-speed Internet access and the proliferation of Internet-connected mobile devices have extended the amount of time spent on the Internet and have made accessing digital content more convenient.

Online Content's Effects on U.S. Employment

The impact of digital trade on U.S. employment in content-related industries is also mixed. No data are available distinguishing employment in online content industries from employment in traditional content industries; consequently, the data presented in this section are a composite of employment in both online and traditional content industries. From 2007 to 2012, employment in the content industries declined by 14 percent

[16] Entertainment includes fees and admissions; audio and visual equipment and services; and other entertainment supplies, equipment, and services. Spending on pets, toys, hobbies, and playground equipment are excluded from these calculations. USITC calculations based on U.S. Department of Labor, Bureau of Labor Statistics (BLS), *Consumer Expenditure Survey, 2006–2011*, September 2012.

[17] Several witnesses spoke of piracy concerns with respect to online entertainment content at the Commission's public hearing for this investigation. See USITC hearing transcript, March 7, 2013, 240–42, 330–31 (testimony of Greg Frazier, Motion Picture Association of America); 348–49 (testimony of Mitch Glazier, Recording Industry Association of America); 262–63 (testimony of Stevan Mitchell, Entertainment Software Association); 251, 256, 293, 300–302, 327 (testimony of Michael Schlesinger, International Intellectual Property Alliance).

[18] Rainie et al., "The Rise of e-Reading," Pew Internet and American Life Project, April 4, 2012.

(table 2.2).[19] The declines were most pronounced in the publishing (book, newspaper, and directory) and sound-recording industries. Employment in other information services (NAICS 5191) grew 38 percent. This growth was driven by growth in Internet publishing and broadcasting and Web search portals (NAICS 519130), which account for 71 percent of employment in NAICS 5191; employment in the NAICS 519130 group grew 67 percent over the same time period. This is noteworthy because the employment growth in the NAICS 519130 group is exclusively attributable to online products and services, including search engines, whereas the other sectors include both online and traditional components.[20]

[19] Content industries are defined to include all of NAICS 51 except for non-game software publishing (only a portion of 5112 is included); 518 (data processing, hosting, and related services); and 517 (telecommunications).

[20] As noted in chapter 6, this trend of declining employment in traditional industries accompanied by increasing employment in comparable online industries is referred to as creative destruction—that is, the technology-driven creation of new industries and jobs and consequent decline in industries and employment associated with older technologies.

TABLE 2.2 U.S. employment in the content industries (online and traditional), 2007–12

Industry	NAICS	2007	2008	2009	2010	2011	2012	% change 2007–12	% change 2011–12
Newspaper, book, and directory publishers	5111	642,370	604,506	521,540	489,875	468,234	445,612	–30.6	–4.8
Game publishers	5112*	16,228	16,898	16,171	16,645	17,516	18,392	13.3	5.0
Motion picture and video industries	5121	359,205	364,847	344,798	362,181	342,324	346,865	–3.4	1.3
Sound recording industries	5122	21,704	18,359	16,700	16,471	16,704	16,201	–25.4	–3.0
Radio and television broadcasting	5151	237,682	232,545	212,327	211,044	213,699	214,698	–9.7	0.5
Cable and other subscription programming	5152	91,929	83,875	85,820	83,513	74,416	75,489	–17.9	1.4
Other information services	5191	127,566	136,760	130,580	142,838	158,365	175,676	37.7	10.9
Total content industries		1,496,684	1,457,790	1,327,936	1,322,567	1,291,258	1,292,933	–13.6	0.1
Content industries' share of total employment		1.09%	1.09%	1.03%	1.02%	0.98%	0.98%		

Source: USDOL, BLS, *Quarterly Census of Employment and Wages*, total private employment estimates as of September; September 2012 data are preliminary.

Note: Data for game publishers are not broken out by BLS. Data here are based on an estimate that game publishers represent 6.4 percent of total software publishers (5112). This figure is provided by the estimates in BLS, *Economic Census*, 2007. The percent changes reported here consequently reflect changes in software publishers as a whole, and not specific trends for game publishers.

Effects of Online Content on Content Creation

The effects of expanding digital trade, and the consequently increased availability and consumption of online content, is most visible at the content delivery or retail stage of the content creation value chain.[21] The increased availability of Internet-delivered content also affects activities, costs, revenues, and employment at other stages of the value chain. In some cases, online content eliminates the need for traditional content intermediaries such as distributors, marketers, and advertisers.[22]

Because of lower digital distribution costs and the higher visibility that can be gained through social networking, authors, songwriters, musicians, and other content creators are now able to reach consumers directly much more easily. For books and music, the following trends have been observed:

- **Books.** Some independent authors—including those rejected by traditional publishers—have met with successful sales by self-publishing e-books and have gone on to license movie and other rights.[23] Self-published e-books are also gaining increasing prominence in online bookstores, where they are typically priced lower than traditionally published e-books.[24] Retailers have begun to embrace self-published books with featured virtual shelf space, such as iBookstore's "Breakout Books."[25] Retailers do this for a variety of reasons, including the ability to offer books at lower prices and the ability to offer increased diversity thanks to unlimited Internet shelf space.

- **Music.** Independent songwriters and musicians, similarly to independent authors, are able to make their music available online without going through music labels. In theory, the lack of an intermediary affords the musician or author higher royalty payments, though the size of the royalty stream depends on the digital format and licensing agreements.

Content Delivery and Online Business Models

Online content may be accessed in several forms—most commonly via downloading or, increasingly, streaming. Table 2.3 describes the most common online content delivery mechanisms. While downloads are by and large the most prevalent online content form, streaming is growing across content industries, enabled by faster broadband, shifting consumer preferences, and new business models. Streaming is many users' preferred

[21] The content creation value chain in this instance refers to the creators—including authors, game developers, and composers—who then sell or license their creations to publishers (software publishers, book publisher, music publishers) or other intermediaries who facilitate reproduction, distribution, marketing, advertising, and licensing for the content creators for sale to the public.

[22] Although this section is focused on the delivery of content via the Internet, content industries are increasingly using the Internet and Internet (digital) technologies in the sense that the production of the content itself may rely on digital networks. For example, in the movie production industry, digital technologies have lowered production costs and facilitated certain activities, such as digital animation and postproduction editing, which can be done remotely with an Internet connection. Even delivery of movies to theatres is increasingly handled digitally via a satellite link or broadband Internet connection. Digital technologies in general have eliminated the need for costly traditional film (most film makers now use digital files) and reduces the cost of film editing and assembly.

[23] Emburg, "Big Publishers Terrified of Kindle Mavericks," October 23, 2010.

[24] Coker, "Why eBook Retailers Are Embracing Self-Published Authors," February 12, 2013. According to Coker, a self-published book priced at $2.99 nets the author about $2.00; for the author to make $2.00 on a traditionally published book, it would have to be priced over $11.00.

[25] Kaufman, "Apple to Highlight Self-Published Books," February 5, 2013.

TABLE 2.3 Digital content delivery mechanisms

Permanent downloads	Users download a digital file, akin to purchasing a physical product in that the user has a copy of the content that can be accessed offline at the user's leisure. However, rights of digital download owners are arguably more limited than the rights of those who purchase physical copies of content in that terms-of-use agreements and technical safeguards frequently limit the transferability of digital content, tethering it to a particular device or set of devices. For example, an e-book purchased from Amazon may only be read on a Kindle e-reader or on a mobile device via an Amazon app, while purchases from Apple can only be read on Apple devices.[a]
Limited downloads	These downloads are limited either by time, by the number of uses allowed, or by the devices they are accessible from. For example, users can "rent" a movie online (or via app) from iTunes at a lower price than it costs to "buy" the movie.
Streaming	Streaming enables viewing or listening in real time, requiring Internet access for the duration of the content. Streaming services do not allow a user to store the content offline for later use. Streaming is often offered through a subscription service where users gain unlimited access to vast libraries of content (for example, Netflix or Spotify) rather than make individual purchases. Streaming may be interactive, i.e., "on demand," allowing users to specifically request particular content, such as with Netflix, Hulu, ABC.com, Spotify, and Rhapsody. Interactive streaming refers to the transmittal of a digital file to the user to be played contemporaneously with the request.[b] Alternatively, streaming may be non-interactive, such as with Internet Radio, where users choose among webcasts over which they have less control (i.e., Pandora, iHeartRadio, live news feeds). Here, services provide live or predetermined music programming to multiple simultaneous users.[c]
Hybrid—cloud storage service	This model combines the idea of purchasing to own with online rather than offline storage. This may involve purchasing online content through the service and storing it, or uploading an existing content library for storage and access across devices. Already common for digital music, the movie industry is also promoting use of an online "locker" to store purchased video content.[d]

Source: Compiled by the USITC.

[a] Hiltzik,"E-book Restrictions," December 22, 2012.
[b] Harry Fox Agency, "Digital Definitions" (accessed February 28, 2013).
[c] Webcasters may operate exclusively on the Internet or may retransmit traditional radio content. Harry Fox Agency, "Digital Definitions" (accessed February 28, 2013).
[d] Through a service called UltraViolet, consumers can store movie and TV episodes they purchase online, allowing them to stream or download them to any connected device. In a partnership with TV and Blu-ray player manufacturers, consumers who purchase certain hardware will get free UltraViolet titles from participating studios, including Sony Pictures, Twentieth Century Fox, and Warner Bros. Orden, "Online Movie Sales Log Rare Increase," January 8, 2013.

method of listening to music, as well as the most common way users access online video.[26] E-books, by contrast, are almost exclusively downloaded. Entities involved in the delivery of online content may use a combination of the delivery mechanisms described above and monetize them in different ways. Common business models include charging per use, offering subscriptions, and providing advertising-supported content for free—or various permutations of all three approaches. Additionally, many companies have adapted their strategies to account for mobile Internet use. U.S. copyright laws may also affect content providers' choice of business model and digital delivery mechanism.

[26] Streaming is a way of delivering and receiving multimedia content in which the multimedia content is constantly received by and presented to an end user while being delivered by a provider. Content may include music; movies, TV programming, and videos; radio broadcasts; games; financial data; and closed-captioned text. Streaming is made possible by the faster broadband Internet connection speeds.

Charging per Use

Some online content providers charge per use—most often per download or per "view" of a video. Charging per use allows consumers to target their purchases most closely to their desired volume of use. Charging per use also allows content providers (online distributors or intermediaries) to charge for single downloads (for example, a single music track, a single TV episode, or a single book volume), which may encourage users to return to buy additional tracks, episodes, or volumes, or even the entire album, episode, or collection. The online distributor or intermediary retains a percentage of this fee. This so-called "agency model" is also a common business model for e-book providers.[27]

Offering Subscriptions

Subscription-based models are commonly associated with content streaming over the Internet, both interactive and non-interactive. Users pay a set monthly or annual fee for unlimited access to a library of content. For example, U.S. Netflix customers pay a monthly fee for unlimited streaming of their movie and TV content. A Rhapsody monthly subscription combines music streaming and downloads,[28] while Audiobooks provides similar subscription services for audio-recorded literature. Subscription services' primary benefit to consumers is their vast content options available for a fixed payment, giving users access to more content than they could purchase outright. Subscription streaming services may also generate value for consumers by recommending content that fits a user's listening or viewing patterns, introducing them to new films, authors, or artists that they might otherwise never have discovered. Nevertheless, some users may prefer "owning" content in the form of permanent downloads, and may use subscription models to identify content that they proceed to purchase through the same service or another one.[29]

Subscription streaming services require Internet connectivity for listening, though other subscription services may allow downloads for a period of time, which can be stored and listened to offline.[30] A challenge for the providers of subscription-based services is maintaining large enough content libraries to attract and keep subscribers.[31]

Offering Content (Often Advertising-supported) for Free

A large portion of online content is free to the user, with revenue generated through the sale of advertising space.[32] Consequently, most online content providers compete with traditional forms of media for advertising revenues. The value of U.S. Internet advertising reached $37 billion in 2012, second only to broadcast TV ($40 billion) and ahead of cable TV ($33 billion), magazines ($23 billion), newspapers ($19 billion), and

[27] Under the agency model, online distributors or other intermediaries act as agents for the publisher. The publisher sets the retail price, and the distributors or intermediaries receive a predetermined margin. In contrast, under a wholesale model the publisher sells the product to online distributors or intermediaries who then resell the product at whatever price they like. E-book pricing has become an issue of legal contention in recent years. Guardian, "Ebooks: Defending the Agency Model," March 12, 2012; *Wall Street Journal*, "What Is 'Agency Pricing'?" April 11, 2012.

[28] Rhapsody website, http://www.rhapsody.com/what-is-rhapsody/get.html (accessed May 24, 2013).

[29] NPD, "After 10 Years Apple Continues Music Download Dominance," April 28, 2013.

[30] Cameron and Bazelon, "The Impact of Digitization of Business Models," June 2011.

[31] Ibid.

[32] A number of online content providers provide both free, advertising-supported content and fee-based content allowing users to access additional features and content or to eliminate ads.

radio ($16 billion). Internet advertising has surpassed all forms of media advertising over the last five years except broadcast TV.[33]

YouTube is an example of the advertising-supported model, where users can view for free unlimited video content that other users have uploaded to the site.[34] Similarly, network TV channels often have websites where users may stream free episodes interspersed with commercials. Free tiers of use are becoming more common among music-streaming services, which may offer both a free version with ads and subscription versions uninterrupted by ads. At least one company offers the free tier without ads, with the goal of attracting users who will eventually be willing to pay to omit ads from additional content.[35] This approach is also common among newspapers, which provide a limited level of online access for free to draw in readers before requiring a paid subscription. Others, however, embrace advertising as a central component of their business model. Pandora continues to offer free access coupled with advertising as a central part of its business plan[36] to compete with traditional radio.[37]

Mobile Models

Online content providers are also adapting their business models to incorporate mobile software applications (apps) as users spend increasing amounts of time on mobile devices, as described in box 2.1. Companies may take a variety of approaches. For example, Pandora offers its mobile app for free, but limits the hours of free ad-supported listening, requiring users to purchase a subscription for unlimited mobile listening. By contrast, PC-based ad-supported listening to Pandora is unlimited.[38] The company decided to cap free listening on mobile devices because the royalties it pays per song are the same, but advertising revenues per listener hour on mobile devices are less than half than those generated on traditional computers.[39]

Internet companies dependent on advertising are working to adapt their strategies to attract mobile advertising. Within Internet advertising, ads on mobile devices have increased rapidly, with revenues growing from $641 million in 2010 to $3.4 billion in2012,[40] and projected to reach $27 billion by 2017.[41] Because the shift to mobile device use is an ongoing and rapidly increasing phenomenon, audience measurement and targeting are less advanced than for PC-based advertising. Much of the content viewed on mobile devices is accessed through apps, where consumer tracking, customization, and other marketing measures reportedly are more difficult than for Web browsers.[42]

[33] IAB, *Internet Advertising Report: Full Year 2012,* April 2013.

[34] YouTube also offers fee-based content.

[35] Rdio offers a free tier of content without advertising, meaning that it is forgoing ads as a source of revenue and paying royalties on the free music essentially out of pocket. Sisario, "For Many Digital Music Services," January 28, 2013.

[36] Advertising accounted for 88 percent of Pandora's revenue in 2012. Pandora, "Form 10-K," 2012.

[37] Sisario, "For Many Digital Music Services," January 28, 2013. Pandora also offers a fee-based ad-free service, Pandora One.

[38] Pandora, "Form 10-K," 2012.

[39] Mobile listening hours account for around three-quarters of total listening hours. Pandora, "Form 10-K," 2012; Sisario, "Pandora to Limit Free Listening," February 27, 2013.

[40] Search advertising, in which ads are linked to particular search terms, accounts for nearly half of Internet advertising revenues ($16.9 billion). Search engines are discussed later in this chapter. IAB, *Internet Advertising Revenue Report: Full Year 2012,* April 2013.

[41] eMarketer, "Facebook to See Three in Ten Mobile Display Dollars," April 4, 2013.

[42] Lohr, "A Big Data Weapon for the Mobile Ad Challenge," April 3, 2013.

BOX 2.1 Online activities increasingly accessed through apps

Apps are software that typically encompass the functions of a single website or activity; users can download them directly to their mobile devices through an online "app store." Some apps provide services comparable to standard computer software (for example, to read books, newspapers, or magazines; to make travel reservations; to look up information; or to send email). Other apps take advantage of being used on a mobile device and offer location-specific information (for example, offering grocery list reminders when the mobile device detects that the user is near a grocery store, or notifying a friend's mobile device that the user is nearby). Many apps are free, although access to certain features or content may require payment or subscription.

The platforms that host the store generate revenue from the apps purchased or downloaded there. The major app stores correspond to the four major smartphone operating systems—Apple's App Store, Google's Play Store, the Windows Phone Store, and BlackBerry World. Although Google accounted for the largest share of apps downloaded worldwide in 2012 (51 percent), Apple accounted for the most revenue generated across the four platforms (74 percent).[a] According to one report, revenue generated by these app marketplaces from consumers globally was $2.2 billion in the first quarter of 2013.[b]

App sales are closely linked to mobile device sales. The number of users owning mobile devices drives the demand for apps and their availability; at the same time, the availability of a wide range of app content makes purchasing a mobile device more desirable, helping to drive mobile device sales. Strong growth of app purchases has been reported in emerging markets such as South Africa, Brazil, and Indonesia, related to those countries' growing base of mobile device users.[c]

Source: Compiled by the USITC.

[a] Tsukayama, "Google Play Gets a Redesign," April 10, 2013.
[b] Canalys, "11% Quarterly Growth in Downloads for Leading App Stores," April 8, 2013.
[c] Ibid.

Advertisers also reportedly pay less for mobile ads than other online ads because consumers are less likely to make a purchase on their phones,[43] perhaps due to the smaller screen size of mobile devices,[44] though consumers' habits are evolving. Mobile retail advertising is further discussed in chapter 3.

Offering an app for free, rather than charging a fee for its download, has been shown to be the most profitable app model. In-app purchases within apps that were initially free to download generate the majority of revenue in app stores in the United States.[45] This model, also known as "freemium," was used by the 10 top-grossing iPhone apps in the United States in February 2013, and is particularly common among games. The base game will often be free and then revenue is generated through microtransactions—small in-game purchases of premium content, such as access to new levels, characters, or challenges.[46] Paid apps accounted for only a quarter of app revenue, despite having a higher average revenue per download, indicating that the freemium model depends more on the volume of users than on the amount spent by each.[47]

[43] Miller, "Advertising Relearned for Mobile," October 28, 2012.
[44] *Byte*, "eBay Drops Mobile Advertising," December 19, 2012; Krashinsky, "Marketing Matters: The 'Small' Problem with Mobile Ads," June 29, 2013.
[45] In-app purchases generated 76 percent of revenue in the Apple App Store for iPhone in the United States in February 2013. The portion is even higher (above 90 percent) in Hong Kong, Japan, China, and South Korea. Koekkoek, "How the Most Successful Apps Monetize," March 2013.
[46] Kommerskollegium, *Minecraft Brick by Brick*, February 2013; Berkman, "How Your Favorite Internet Companies Make Money," October 9, 2012.
[47] In-app purchases generated 76 percent of revenue in the Apple App Store for iPhone in the United States in February 2013. The portion is even higher (above 90 percent) in Hong Kong, Japan, China, and South Korea. Koekkoek, "How the Most Successful Apps Monetize," March 2013.

Effects of Content Acquisition Costs on Business Models

Content acquisition costs—royalty payments and the costs associated with negotiating licenses—vary by industry and may affect the choice of digital business model or delivery mechanism. The book, music, and video industries are also referred to as "copyright industries," as the products may be protected by and subject to the requirements of copyright law.[48] Copyright protections/restrictions apply to digital content, challenging the law to keep pace with new technologies and stymieing or facilitating new digital business models in the process.

The substantial difficulty of applying existing copyright rules to Internet-based technologies recently led the Copyright Register (head of the U.S. Copyright Office) to call for an updating of the law to provide authors, businesses, courts, and consumers with clearer roadmaps.[49] For example, the complex music copyright framework distinguishes between subscription and non-subscription services and between interactive and non-interactive music services when determining eligibility for statutory licenses and the royalty rates under those licenses.[50] Interactive "on-demand" services, such as Spotify or iTunes, must negotiate licenses with individual sound-recording copyright owners, which can be time consuming and expensive. Consequently, non-interactive services, such as Pandora, do not stream specific songs on demand and restrict the number of songs that are played on a particular station from a particular artist within certain time constraints, in order to avoid becoming an interactive service and losing the benefit of fixed statutory rates.[51] The question of what constitutes public performance, which the copyright holder is entitled to control, arises in the context of streaming music and video via the Internet, as discussed in box 2.2.

BOX 2.2 New broadcast TV streaming service tests rights of TV copyright holders

A start-up company, Aereo, is testing a model in which it retransmits live broadcast TV that its subscribers can watch on any Internet-enabled device. This is similar to other streaming services that enable subscribers to remotely access live or recorded TV via the Internet (such as Slingbox or Dish's Hopper). However, Aereo does not pay the TV companies to retransmit their programming. Because of the company's technical setup, in which each subscriber has a unique antenna in Aereo's datacenters, the company maintains that it is merely facilitating thousands of individual private performances, arguably making the service akin to a DVR. The company is currently facing challenges of copyright infringement from the major broadcast TV networks, the outcome of which will further clarify the boundaries of acceptable business models for online content providers.[a]

[a] Pepitone, "Aereo: Streaming TV Startup at Center of Media Storm," February 7, 2013; Parloff, "Aereo: The Fight Is Not Over," July 12, 2012.

[48] According to one economist, the core copyright industries are those whose primary purpose is to create, produce, distribute, or exhibit copyright materials. They include newspapers and periodicals, motion pictures, recorded music, radio, and TV broadcasting, and computer software. Siwek, *Copyright Industries in the U.S. Economy*, 2011.

[49] Pallante, "The Register's Call for Updates to U.S. Copyright Law," March 20, 2013, 1.

[50] Gervais, statement to the Subcommittee on Courts, Intellectual Property and the Internet, May 16, 2013, 12–13.

[51] Pandora, "Form 10-K," 2012; Parks, *Music and Copyright in America*, 2012; SoundExchange website, www.soundexchange.com; government official, telephone interview by USITC staff, April 2012.

Many U.S.-based online content providers earn revenues abroad. Any decision to expand abroad requires them to consider content acquisition costs. Unlike in non-copyright industries, the Internet does not open up an immediate portal to a global consumer base; rather, online providers of digital content expand to new countries piecemeal as they negotiate licensing arrangements for their content libraries for each location. While copyright holders may view a lack of adequate copyright protections as a substantial international trade barrier, many distributors of digital content view the current patchwork of copyright licensing regimes as slowing expansion of innovative new services by requiring costly and repetitive negotiations or making it difficult or impossible to identify economically viable arrangements.[52] Chapter 5 further discusses the challenges inherent in applying intellectual property rules to the Internet-based environment and the importance of balancing the rights and responsibilities of copyright holders with those of Internet intermediaries to foster innovation.

Growth in Online Content Delivery

The share of traditional content industries in the United States that are accessed online is highest for music and game content, while the shares for videos and books are smaller but growing (table 2.4). This may reflect the fact that most of the content industries have already largely transitioned to a system where even the physical media relies on digital files and electronic devices, such as CD and DVD players, PCs, game consoles, or TVs, regardless of whether the content was delivered over the Internet. By contrast, reading a book in physical print form requires no intervening technology once the reader has acquired the book.

TABLE 2.4 U.S. digital content revenues and share of total content industry revenue, 2012

Content industry	Digital revenue 2012 (Billion $)	Total revenue 2012 (Billion $)	Digital revenue/total (%)
Music[a]	4.1	7.1	57
Games[b]	5.9	14.8	40
Videos[c]	5.4	18.0	30
Books[d]	3.0	15.0	20

Source: Compiled by the USITC.

[a]Friedlander, "News and Notes on 2012 RIAA Music Industry," n.d. (accessed April 5, 2013).
[b]Includes downloadable games, add-on downloadable content, online subscriptions, mobile apps, casual browser-based games, and social network games. ESA, written submission to the USITC, March 14, 2013, 2–3; NPD Group, "Research Shows $14.80 Billion Spent," February 6, 2013.
[c]Orden, "Online Movie Sales Log Rare Increase," January 8, 2013.
[d]Trade books, encompassing adult fiction and nonfiction, children's books, and young adult fiction. Bookstats 2013 report. Owen, "Ebooks Made Up 20% of the U.S. Consumer Book Industry," May 15, 2013.

Music

Music is now predominantly a digital industry, leading the way among content industries, despite a tumultuous transition to Internet delivery. The U.S. music-recording industry's revenues peaked in 1999 at $15 billion but fell by half over the next decade, reaching $7.1 billion in 2012. Reportedly, this decline was in part due to the online theft associated with newer technologies that afforded more opportunities to distribute music files over

[52] In 2012, Pandora reported not being able to find economically suitable licensing arrangements in other countries. Pandora, "Form 10-K," 2012. Similarly, Netflix launched its streaming service in 2007, but did not offer streaming services internationally until 2010. It is now available in more than 40 countries.

the Internet. [53] Industry representatives cite 1999 as the year Napster gained in popularity, enabling the peer-to-peer file sharing on a large scale that was later found to be unlawful.[54]

Demand for digital music has increased. The Internet has created substantial opportunities for online music services, such as Apple's iTunes, though giving users the ability to download individual songs diminished their demand for traditional full-length albums—a longstanding and lucrative industry staple.[55] By 2012, 57 percent of music industry revenues came from digitally distributed formats; revenue from digitally distributed formats grew 14 percent during 2011–12 to total $4.1 billion (table 2.3).[56] Apple's iTunes accounted for 63 percent of all online music downloads sold in the United States in the fourth quarter of 2012, followed by Amazon's Music Store with 22 percent.[57]

Downloads are still the predominant digital music format, but that situation is changing. While downloads accounted for three-quarters of online revenues in 2012, their growth was outpaced by streaming services that year. Music streaming services accounted for over $1 billion in industry revenues in 2012, up 58 percent from the year before.[58] They include paid interactive subscription services (such as Spotify), non-interactive services (i.e., Internet radio, such as Pandora, which offers both free advertising-supported service and paid ad-free service, Pandora One), and non-subscription sites (such as YouTube, which also offers subscription services for some of its content).

Music-streaming services are becoming more popular. Pandora and Spotify are leaders in the U.S. market for music streaming, and are joined by services such as iHeartRadio, Rhapsody, Rdio, and Grooveshark. While many music streaming companies began as start-up Internet companies, larger technology companies (such as Apple, Amazon, and Google) are developing streaming services of their own.[59] Moreover, many radio stations now offer comparable streamed programming online. Clear Channel, which owned 840 domestic radio stations in 2012, is an example of a traditional media company with a successful Internet presence—iHeartRadio.

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[53] RIAA, written submission to the USITC, February 28, 2013, 8; Friedlander, "News and Notes on 2012 RIAA Music Industry," n.d. (accessed April 5, 2013); USITC hearing transcript, March 7, 2013, 248 (testimony of Mitch Glazier, RIAA).

[54] Peer-to-peer file sharing technology connects individual computer users to each other directly, without going through a server to retrieve content. To use this technology, users download and install an application that enables them to search for and download files on other users' computers. USITC hearing transcript, March 7, 2013, 248 (testimony of Mitch Glazier, RIAA); Parks, *Music and Copyright in Americ*a, 2012, 183–85.

[55] Cameron and Bazelon, "The Impact of Digitization of Business Models," June 2011; Parks, *Music and Copyright in Americ*a, 2012.

[56] Friedlander, "News and Notes on 2011 RIAA Music Shipment Data," n.d. (accessed February 28, 2013); Friedlander, "News and Notes on 2012 RIAA Music Industry," n.d. (accessed April 5, 2013); RIAA, written submission to the USITC, February 28, 2013, 8.

[57] NPD, "After 10 Years Apple Continues Music Download Dominance," April 28, 2013. Over the decade of its existence, Apple's iTunes has sold more than 20 billion songs globally and has expanded into 119 countries. Sisario, "Now That AC/DC's There, Who's Still Missing?" November 21, 2012; Sisario, "Digital Notes: iTunes Expands to 56 Countries," December 4, 2012.

[58] Friedlander, "News and Notes on 2012 RIAA Music Industry," n.d. (accessed April 5, 2013). For companies offering streaming services under statutory license (such as Pandora and other Internet radio providers), these data capture only distributions for digital performance royalties from SoundExchange (a royalty collection and distribution organization), rather than the revenues of the music service itself, which are significantly higher. For example, Pandora had revenues of $427 million in 2012, 56 percent of which was paid to SoundExchange and would be included in these data. Pandora, "Form 10-K," 2012.

[59] Gupta and Grover, "Analysis: Big Tech Tests the Waters," March 22, 2013.

Games

Internet-based delivery of game content has grown across the video game industry. In some cases, online delivery merely allows users to download game software that would have otherwise been purchased in brick-and-mortar stores. But online delivery also gives rise to purely Internet-oriented games—such as social network games, mobile app games for portable Internet-connected devices, and online games where communicating with and playing against other users is central to the game experience.

Spending on Internet-based games continues to grow. Online content spending in the U.S. video game industry grew 16 percent in 2012, reaching $5.9 billion. Online game content, which includes full-format game and add-on content downloads, game subscriptions, mobile app games, and social network games, accounted for 40 percent of total entertainment software spending in 2012, up from 20 percent in 2009.[60] Industry sources report that the most frequently played online games are casual social games—puzzles, board games, game shows, trivia games, and card games—followed by action, sports, strategy, and role-playing games; and persistent multiplayer universe games.[61]

Multiple Internet-based game formats increase consumer options. Games are available for download through diverse distribution channels, including publisher websites, game distribution services, console networks, app stores, or mobile carrier services.[62] Casual social games that can be played on mobile devices and social networking sites are a rapidly growing segment. These games are characterized by their simple controls, broad appeal across demographics, and free-to-play or microtransaction business model (often through in-game purchases of additional game features or access to additional playing levels—which can help retain customer interest).[63] These games may be published by leading multinational software publishers, such as Activision and Electronic Arts, but are often also provided by small and start-up software developers and game publishers. Zynga, for example, is a leading provider of online social games, having started out creating game apps for Facebook, such as Words with Friends and Farmville.[64]

Online and cloud-based games are popular and profitable. They include individually-played games; games played among a small number of users; and massively multiplayer online role-playing games that have thousands of users around the world, such as World of Warcraft. Though the games themselves may be purchased physically or downloaded online, they also generate revenue through subscriptions to play them as cloud-based games where users interact with one another (developing relationships and online personas) and through sales of additional in-game online content. For online games, one source reports that more profits are earned by online game system operators (who host the games on their servers) than by the game publishers.[65] This gives game publishers an incentive to host their own dedicated forums for their games, rather than work through third-party platforms. For example, Activision Blizzard designed and published World of

[60] NPD Group, "Research Shows $14.80 Billion Spent," February 6, 2013; ESA, written submission to the USITC, March 14, 2013, 2–3.

[61] ESA, *2012 Essential Facts about the Computer and Video Game Industry* (accessed January 2013), 4.

[62] USITC, hearing transcript, March 7, 2013 (testimony of Stevan Mitchell, Entertainment Software Association).

[63] Electronic Arts, "Form 10-K," 2011. Zynga reports generating revenue though the in-game sale of virtual goods, mobile game download fees, and advertising. Zynga, "Form 10-K," 2012.

[64] Zynga, "Form 10-K," 2012.

[65] IBIS, *Video Games in the U.S. Industry*, 2012.

Warcraft and operates its online presence.[66] Console producers also derive revenue from publishing and operating their online gaming services.[67]

The popularity of game consoles also drives the demand for downloaded games. Games may be downloaded from the Internet to be played offline, rather than being purchased at physical retail stores. PC online gaming distribution platforms facilitate purchases and downloads of full games. Leading gaming distribution platforms include Steam (Valve Software), Direct2Drive (GameFly), Origin (Electronic Arts), uPlay (Ubisoft), and Amazon, as well as the console operators' marketplaces.[68] The ubiquity of hardware platforms is a key driver of digital game sales. Video game offerings themselves drive demand and sales for other complementary products in the ecosystem, such as for game consoles (including Microsoft Xbox, Nintendo Wii, and Sony PlayStation) and point-of-sale activation cards.[69]

Videos

The market for online video is difficult to quantify as a portion of traditionally viewed video, in part because there are so many different models and types of video within the traditional landscape, including broadcast TV, cable TV, movies in theaters, movies on cable channels, movies on broadcast TV channels, on-demand programming, content recorded for later viewing (i.e., via DVR), purchased DVDs, or rented DVDs. Each of these now involves an avenue for viewing the material over the Internet, and the value of the Internet option is not clearly separable. Each model approaches Internet video in different ways. In many cases, online content is provided as a free service, monetized in part by advertising revenue but also intended to drive viewership onto traditional channels.

The Internet has propelled new forms of video consumption. User-generated short-form videos viewed on sites such as YouTube have become very popular. Unlike the long-form TV episodes and movies on Netflix and Hulu, which compete with traditional offline distribution mechanisms, short-form video is largely unique to the Internet. In January 2013, 180 million people, representing 83 percent of U.S. Internet users, watched some form of video content online. These viewings averaged 5.7 minutes long and were led by Google sites, primarily YouTube, which garnered the most unique visitors, followed by Facebook, Vevo, NDN, and Yahoo sites.[70]

New Internet-based delivery technologies are changing home video entertainment options. In 2012, online distribution accounted for 30 percent of the U.S. home video entertainment market, which includes traditional long-form movie sales or rentals for home consumption, compared to 19 percent in 2011, according to data from the Digital Entertainment Group.[71] Total U.S. home video entertainment sales grew slightly to $18 billion in 2012 as online revenue growth offset the decline in physical purchases and rentals, though the market is still down 20 percent from its peak in 2004. The declines were partly attributable to consumers increasingly substituting inexpensive physical rentals from Netflix or Redbox for outright DVD purchases.[72] Netflix's streaming service

[66] IBIS, *Video Games in the U.S. Industry*, 2012.
[67] Ibid.
[68] Oxford, "Top 10 Digital Distribution Platforms," December 23, 2011.
[69] USITC, hearing transcript, March 7, 2013 (testimony of Stevan Mitchell, Entertainment Software Association).
[70] Comscore, "ComScore Releases January 2013 U.S. Online Video Rankings," February 21, 2013.
[71] Orden, "Online Movie Sales Log Rare Increase," January 8, 2013.
[72] Fritz, "Home Video Revenue Stops Falling," January 8, 2013.

began in 2007, further accelerating the shift away from DVD purchases. In 2012, subscription streaming revenue grew 45 percent, and download sales increased by 35 percent.[73]

New Internet-based delivery technologies are changing the movie industry. As with online music, the online movie industry is undergoing a shift from a transactional download model to a subscription-based approach. This is reflected in Netflix's increasing market share, surpassing Apple's share in 2011 to account for 44 percent of the online movie market by revenues.[74] Apple is still the largest player in the transactional part of the online video market, where customers pay per video purchased or rented, and competes with video game console operators Microsoft, Nintendo, and Sony, as well as Amazon Instant Video and Walmart's Vudu.[75]

The Internet is rapidly changing how broadcast TV is delivered into homes. In addition, many new companies are producing content. Key trends are discussed below:

- TV programming content is increasingly being delivered via the Internet. This viewing method has become increasingly popular over the last five years.[76] Nearly all broadcast and cable TV networks provide free streaming of their programming online.[77] Although most TV is still consumed over traditional platforms, a study from ComScore reported growth in audiences accessing content via multiple platforms (TV and online) as well as online-only audiences. Among the audiences of the 10 leading broadcast and cable network groups, on average 17 percent accessed TV via multiple platforms, and 11 percent accessed TV exclusively online.[78]

- Online video content in general is increasingly being delivered via Internet-enabled TVs and input devices that connect users with online video streaming sites such as Hulu, Netflix, and YouTube.

- New technologies have increased the popularity of TV streaming. Cable companies and other third parties may provide streaming services enabling their subscribers to access live or recorded TV content by accessing their accounts through the Internet, using technologies such as the Slingbox or Dish's Hopper.

- Content distributors are increasingly becoming content producers. Online distributors of content are also increasingly producing or publishing their own content. For example, Internet companies like Amazon, Microsoft, and Netflix

[73] Orden, "Online Movie Sales Log Rare Increase," January 8, 2013; Digital Entertainment Group, "Home Entertainment Moves toward Growth in 2012," January 8, 2013.

[74] Cyran, "Netflix Surpasses Apple to Take Lead," June 1, 2012.

[75] Dilger, "NPD: Apple's iTunes Takes Biggest Piece," January 31, 2013.

[76] All TV and cable broadcasts are, of course, digital. However, in this study the analysis focuses on content delivered via the Internet and not that delivered via cable networks.

[77] Reardon, "Online TV Viewing on the Rise," September 26, 2008. Hulu.com dominated free streaming TV, accounting for 43 percent of total streams during 2012. The five broadcast network sites (CBS.com, ABC.com, FOX.com, NBC.com, and CWTV.com) accounted for another 30 percent of total streams. NPD Group, "Free Streaming Making Inroads," February 4, 2013.

[78] ComScore, "How Multi-Screen Consumers Are Changing Media Dynamics," August 28, 2012.

are developing original Internet-only TV programming.[79] Being able to offer exclusive content increases subscriber retention and draws new viewers. YouTube, which operates largely on an advertising model, also pays producers to create content that is original to YouTube.[80] In 2013, YouTube began offering paid video channels as well.[81]

Books

Digitally delivered content is of increasing importance to the book publishing industry, particularly for trade books,[82] though the transition to online delivery has been slower than in other content industries and printed books continue to dominate sales.[83] Both e-books and downloads of audio book recordings are growing in absolute terms and as a portion of U.S. book publishing revenue, though e-book revenues ($3.04 billion) in 2012 were considerably larger than those of audio downloads ($241 million).

E-books account for a small share of total book sales, but their share of sales is growing. In 2002, digital content revenues in trade book publishing were negligible; by 2006, they were still less than 1 percent.[84] By 2012, however, e-books accounted for 20 percent of industry revenue, having grown by 44 percent from the prior year.[85] Trade book publishing overall, including e-books and physical books, also grew in 2012. This growth is attributable largely to growth in e-books, which offset declines in mass market paperbacks, while revenues from hardcover books grew slightly. E-books have an advantage over the mass market paperbacks because they are available at the initial launch of the hardcover version, while paperbacks are released later.[86]

Overall publishing industry revenues fell slightly in 2012. Eighty percent of U.S. publishers produce e-books, according to a 2012 survey, and e-book content accounted for more than 10 percent of annual revenues for more than one-third of publishers; the figure was higher for larger publishers.[87] Even though trade book publishing is a growing industry segment, the publishing industry declined in other segments in 2012—although those declines are not clearly tied to the growth of e-book sales.[88]

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[79] Netflix reportedly spent $100 million producing the drama series, "House of Cards," which debuted on its streaming service in February 2013. A new season of "Arrested Development" launched in May 2013, and the company has three additional series in the pipeline. Microsoft is producing original content for its Xbox consoles; users access the content through an Internet connection. Amazon is also reportedly making pilot episodes for more than 10 shows. The pilots will be available on its streaming service (Amazon Prime Instant Video) for consumers to vote on which should be turned into full-season offerings. Stelter, "Don't Touch That Remote," March 4, 2013.

[80] Stelter, "Don't Touch That Remote," March 4, 2013.

[81] Bajarin, "How Paid YouTube Channels Could Kill Cable TV," May 20, 2013; *Economist*, "Online Video: Worth Paying For?" May 11, 2013.

[82] Trade books publishing includes adult fiction and nonfiction, children's books, and young adult fiction, as opposed to educational publishing and professional and scholarly publishing. Trade books are books published for sale to the general public through booksellers. Association of American Publishers website, http://www.publishers.org/ (accessed May 29, 2013).

[83] Association of American Publishers, written submission to the USITC, March 14, 2013.

[84] Forrester Research estimates that the U.S. e-book market will reach $13.6 billion by 2017. Kucera, "Inkling Builds a Better E-Book," February 12, 2013.

[85] Bookstats, "Bookstats 2013 Now Available," May 15, 2013.

[86] Owen, "Ebooks Made Up 20%," May 15, 2013.

[87] Aptara, *Revealing the Business of eBooks*, September 2012.

[88] Declines were recorded in religious books, professional books, and educational materials. Boog, "Adult Hardcover Revenues Down Nearly 7%," April 11, 2013; Milliot, "Trade Up, Industry Down in 2012," April 11, 2013.

A small number of companies account for most e-book sales. Most publishers use multiple distribution channels for their e-books, including Amazon, Apple's iBookstore, and Barnes & Noble, as well as their own websites. Amazon is the most popular sales channel for e-books, used by 68 percent of e-book publishers, compared to 58 percent using Apple's iBookstore. Amazon reportedly is the most lucrative sales channel.[89] Although estimates vary, Amazon reportedly accounts for 65 percent of the U.S. e-book market on a unit basis, followed by Barnes & Noble with 25 percent and Apple with 10 percent.[90] Amazon reported that its multibillion-dollar e-book segment grew 70 percent in 2012, linked to sales of the company's Kindle tablet. The steep rise in e-book sales was in sharp contrast to Amazon's 5 percent growth in sales of physical books in 2012—the lowest book sales growth rate in Amazon's 17 years as a bookseller.[91]

Social Media[92]

This section provides an overview of two types of social media—social networking sites and user review websites. The distinction between social media and the content industries is becoming increasingly blurred. For example, many video games have an inherently social component, allowing users to create online identities, chat via text, or speak live over microphones. Even online newspapers typically allow comments on articles, host live interactive chat sessions on identified topics, and feature icons allowing their content to be reposted on various social networks.[93] Many sites incorporate user reviews or link to user review websites. Additionally, as discussed in the beginning of this chapter, social media sites are integrating with content providers, becoming a venue for discovering and sharing music and video content, as well as a platform for playing games.[94] Twitter, for example, recently debuted a mobile music application that allows its users to play music from iTunes, Rdio, and Spotify.[95] Similarly, Facebook allows users to connect to a host of online entertainment providers through its app center, which gives access to popular third-party music, video, and game services.

Social Networking Sites

Social networking sites are increasingly popular as they move from just casual social use to taking on larger roles in supporting and generating commercial activities. Although the distinctions among them are blurring, they include casual networks such as Facebook, Foursquare, and Google+; professional networks such as LinkedIn; traditional blogging networks such as Blogger and WordPress; and microblogging networks such as Tumblr and Twitter. Social networks have become embedded in the lives of millions of users, and

[89] Aptara, *Revealing the Business of eBooks*, September 2012.

[90] Apple may be gaining U.S. market share at the expense of Barnes & Noble. *Digital Book World*, "Apple iBooks at 24 Percent Worldwide Ebook Market Share?" February 28, 2013.

[91] Amazon did not disclose specific e-book sales and Kindle device sales. Amazon, "Amazon.com Announces Fourth Quarter Sales up 22% to $21.27 Billion," Press release, January 29, 2013.

[92] This section addresses online products and services that revolve around user participation and content generation, including social networking, online dating, and user review sites, collectively referred to here as social media.

[93] For example, at the bottom of a cnn.com article, readers can click buttons to share on Facebook, Twitter, Google Plus, LinkedIn, Reddit, StumbleUpon, and Del.icio.us, in addition to emailing or printing.

[94] For example, Netflix recently successfully lobbied for an amendment to the Video Privacy Protection Act (VPPA) that would allow its U.S. users to automatically share details about the video content they watch. The original VPPA barred video rental disclosure without the customer's written consent each time. *Legal Times* Blog, "After Privacy Fix, Law Firm's Netflix Advocacy Ends," April 22, 2013.

[95] MacMillan, "Twitter Debuts Mobile Music Application," April 18, 2013.

they are increasingly accessed through mobile apps rather than PCs.[96] The U.S. audience for social networking in 2012 was estimated to comprise 172 million users. People spend more time on social networking sites than any other category of websites—one-fifth of time online using PCs and one-third of time using mobile devices is spent on social networking sites.[97]

Social network sites allow users to connect with one another to share information. Users may create profiles; post content such as pictures, text, video, purchases, and physical location; and connect with other users directly or by "liking," "following," linking to, commenting on, or sharing their content. Increasingly, social networking is enabling users to track and share their Internet experiences broadly by linking activity on other sites—such as articles read, movies watched, music listened to, and items purchased—to the user's social networking profile.

The top five social networking sites in the United States by number of unique visitors in 2012 were Facebook, Blogger, Twitter, WordPress, and LinkedIn, as shown in the following tabulation. Facebook accounted for 60 percent of all revenue generated by social networking sites.[98]

Leading U.S. social network sites by number of unique visitors, 2012

Social network site	Unique PC visitors, (1,000)
Facebook	152,226
Blogger	58,518
Twitter	37,033
Wordpress	30,945
LinkedIn	28,113
Pinterest	27,223
Google+	26,201
Tumblr	25,634
MySpace	19,680
Wikia	12,594

Source: Nielsen, *Social Media Report,* 2012.

Revenue Models

Social networking sites typically derive most of their revenue through sale of advertising space, much like other Internet sites.[99] These sites reportedly account for a growing share of total online and offline advertising revenue because of their ubiquity (they are accessible by PC and on mobile devices), the amount of time consumers spend on such sites, and the specific consumer information collected by the site—all of which facilitates increasingly targeted advertising.[100]

Retailers account for a large portion of advertising revenues for social networking sites. For example, the majority of Facebook's advertising sales come from retailers, followed

[96] Consumers increased time spent on social network mobile apps by more than 75 percent from 2011 to 2012. Nielsen, *Social Media Report*, 2012, 15.

[97] Ibid, 14.

[98] Kaczanowska, *Social Networking Sites in the U.S.*, April 2012.

[99] For example, Facebook generated more than 80 percent of its $5.1 billion in revenue in 2012 from advertising. Facebook, "Form 10-K," January 29, 2013.

[100] Kaczanowska, *Social Networking Sites in the U.S.*, April 2012.

by telecommunications and financial services companies.[101] One in eight ads on the Internet was reportedly socially enabled in 2012, meaning they allowed consumers to "like" or "follow" products or brands on social networks.[102] By doing this, consumers provide free word-of-mouth advertising to their social network contacts for products and brands.

Subscriptions and add-on content also generate revenue. LinkedIn, for example, charges subscriptions for access to premium features, while the basic features are free. Facebook earns revenue through consumer purchases of apps designed for the social network, particularly from game apps.[103] Facebook earned 12 percent of its 2011 revenue (11 percent for the first quarter of 2012) from in-app purchases and advertising attributable to Zynga's games.[104] Facebook also provides a platform that allows developers to create social apps and websites easily integrated with Facebook, which augments both advertising opportunities and add-on content purchases. As of December 2012, more than 10 million apps and websites were integrated with Facebook.[105]

Global Reach of U.S. Firms

Social networking sites are popular globally.[106] Facebook and LinkedIn are reportedly experiencing faster growth in foreign markets than in the United States.[107] For example, 82 percent of Facebook's over 1 billion users accessed the site from outside the United States and Canada in 2012,[108] although Facebook's presence in the United States and Canada still generates the largest share of the company's revenue[109] (figure 2.2). LinkedIn reported that 36 percent of its $972 million revenues in 2012 were generated outside the United States.[110]

Industry Employment, Revenue, and Linkages with Other Sectors

Employment in the U.S. social networking sector was estimated by one industry observer to be 26,000 people in 2012, and is expected to grow 40 percent annually for the next five years.[111] Industry revenues were estimated to be $4.8 billion in 2012, and are projected to grow at an annual rate of 27 percent over the same period.[112] Higher revenues for such

[101] Kaczanowska, Retail and e-commerce and financial services are discussed in more detail in chapter 3.

[102] Comscore, *U.S. Digital Future in Focus 2013*, February 2013, 21.

[103] See the discussion above on games for additional information. Kaczanowska, *Social Networking Sites in the U.S.*, April 2012.

[104] Facebook, "Prospectus," April 23, 2012.

[105] Facebook, "Form 10-K," January 29, 2013.

[106] Social networking sites are globally popular despite restrictions some governments place on their use, most notably in China. Censorship measures are discussed in more detail in chapter 5.

[107] Kaczanowska, *Social Networking Sites in the U.S.*, April 2012.

[108] Facebook is available in 70 different languages, and the company has sales offices in more than 20 countries. The number of users in Brazil, Indonesia, and many Asian countries grew more quickly than those in the United States, Canada, and Europe, though the latter users generated significantly more revenue. Facebook, "Form 10-K," January 29, 2013.

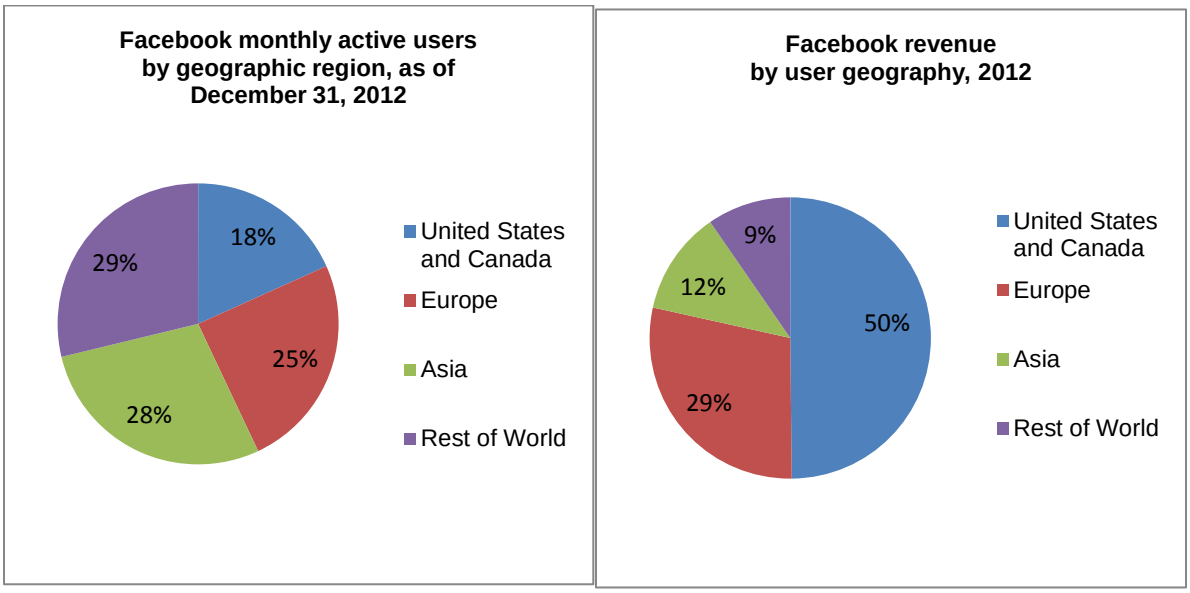
[109] Revenue is allocated to geographic region based on the location of users when they perform a revenue-generating activity. This is separate from location of the advertisers or marketers themselves. Ibid.

[110] LinkedIn reports that its 2012 revenues were up 86 percent from 2011, with registered users increasing by 39 percent as well. LinkedIn, "Form 10-K," 2012.

[111] Kaczanowska, *Social Networking Sites in the U.S.*, April 2012.

[112] Ibid.

FIGURE 2.2 Geographic breakdown of Facebook's 1.06 billion users



Source: Facebook, "Form 10-K," January 29, 2013.

sites are driven by several factors that encourage users to increase the amount of time they spend on social networking sites.[113] These factors include the growing number of apps for mobile devices, with the result that apps accounted for more than one-third of time spent on social networks in 2012; widespread availability of mobile broadband; and the proliferation of mobile Internet-connected devices that have increased both the functionality and accessibility of social networking sites.[114]

Social networking sites are increasingly seen as a business tool—an essential part of marketing and advertising strategies. They can help business promote themselves and their products, provide customer services, and promote content:

- **Business promotion.** Businesses not only buy advertising space on social networking sites, they increasingly set up profile accounts themselves—developing networks of previous or potential customers, posting information about products and sales, and acquiring endorsements in the form of "likes" or "followers."

- **Customer service.** Companies' social network pages also become platforms for customer service. Customers can use pages like these to comment on or ask questions about products and services.

- **Content dissemination.** Such networks also boost the distribution and visibility of other online content, such as news, music, and video. Content can be disseminated via links to separate websites that repost the content on sites like Reddit, Pinterest, StumbleUpon, Twitter, Facebook, and Google+.[115]

[113] Kaczanowska, *Social Networking Sites in the U.S.*, April 2012.
[114] Consumers increased time spent on social network mobile apps by more than 75 percent between 2011 and 2012. Nielsen, *Social Media Report*, 2012, 15.
[115] Nielsen, *Social Media Report*, 2012, 4.

Online Dating

Another variation of social networking on the Internet is online dating, used by approximately 40 million people in the United States.[116] This is reportedly a $2 billion dollar industry, led by companies such as eHarmony and Match.com.[117] These matchmaking sites are geared towards facilitating romantic relationships between users. Their popularity has been driven, according to one source, by societal trends of people relocating away from family and friends who might traditionally serve as matchmakers as well as people living longer and looking for new relationships later in life.[118]

Dating websites are usually subscription based, though free and freemium models are employed as well.[119] As in other online content industries, mobile apps are changing the landscape. Apps are using location-based features to enable a more casual online dating phenomenon that emphasizes proximity and convenience. For example, Tinder is a smartphone app which matches people based on a geographical radius and common Facebook friends.[120]

User Review Websites

User review websites add value to the economy by reducing transaction and information costs.[121] These websites aggregate user-generated content. They are becoming increasingly common and evaluate all manner of goods and services. Such websites include Angie's List (home contracting services); TripAdvisor (hotels); Urbanspoon (restaurants); G2 Crowd (software platforms);[122] and WebMD (healthcare providers). User reviews are also increasingly common as a feature in many online retail websites. For example, sellers on Amazon and eBay are rated by those they transact with, and consumers are able to review the products being sold on retailers' websites, such as BestBuy, the Gap, Lowes, Macy's, and Sears.

Yelp is one of the largest user-review websites. Well known for its customer-generated reviews of restaurants, Yelp also reviews a variety of services. Reportedly 100 million people globally used Yelp in January 2013. TripAdvisor has less than 2 million businesses listed, but offers 60 million reviews, triple the size of Yelp.[123] Google Places has integrated a rating service into its search and map services.

User review websites use different business models. Typically business owners can pay to "claim" the page associated with their business, respond to reviews, and upgrade their profiles with more detailed information, as well as sponsor search results. Angie's List is unusual in that consumers, rather than businesses, must pay a membership fee to use the site, and businesses cannot advertise on the site unless they offer members a discount.

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[116] Hamedy, "Online Dating on the Go," March 26, 2013; *Economist*, "Love at First Byte," December 29, 2010.

[117] Moldvay, *Dating Services in the U.S.*, March 2013.

[118] *Economist*, "Love at First Byte," December 29, 2010. See also Hitsch et al., "Matching and Sorting in Online Dating," 2010.

[119] The freemium model—offering service initially for free but requiring payment later for additional service or content—is discussed in the section above on "Content Delivery and Digital Business Models."

[120] Hamedy, "Online Dating on the Go," March 26, 2013.

[121] Moore, "Grapevine Alerts Businesses to Online Customer Reviews," February 28, 2013.

[122] Johnson, "G2 Crowd Puts CAD Software Reviews in Hands of Users," March 14, 2013.

[123] Null, "Yelp Alternatives: Which User Review Services Matter?" February 12, 2012.

The proliferation of online review websites has also enabled the creation of the "reputation management" industry, with companies paying consultants to manage their online reputations. One source reports that small and medium-sized enterprises (SMEs) spent $1.6 billion managing their online reputations in 2011.[124] One small company aggregates user reviews of restaurants from 10 different sites and sends restaurant owners alerts when their restaurants have been reviewed.[125]

Search Engines

Internet search engines occupy a unique position in the online world, both guiding users to content and benefiting from the demand for that content. Search engines enable users to navigate the Internet by organizing and making searchable content such as webpages, images, or other digital files. The content is usually automatically indexed according to complex algorithms.[126] Search engines are intermediaries in the sense that they connect users with third-party content, as opposed to hosting the content themselves or making decisions to disseminate the content.[127]

Search engines typically generate revenue through online advertising, rather than by charging users for their services.[128] For example, Google, Microsoft's Bing, and Yahoo all use auction-based advertising models designed to deliver ads relevant to search queries.[129] An OECD report points out that this free, advertising-based model works best when the volume of viewer traffic is very large or very specialized, such as in a search query.[130] Although revenues are generated incrementally in relatively small amounts, the sheer volume of Web traffic makes this model profitable.[131] Search engine advertising generated $16.9 billion in 2012, accounting for nearly half of all online advertising.[132]

Google was the leading general-purpose search engine in the U.S. search market in 2012, with 67 percent market share by number of searches, followed by Microsoft's Bing (16 percent) and Yahoo (12 percent).[133] General-purpose search competes with specialized ("vertical") search engines, which are topic-specific sources of searchable information. Examples of specialized search engines include Kayak (travel searches), Monster.com (job searches), and WebMD (health searches).[134]

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[124] Moore, "Grapevine Alerts Businesses to Online Customer Reviews," February 28, 2013.

[125] Ibid.

[126] OECD, "The Economic and Social Role of Internet Intermediaries," April 2010, 12.

[127] Ibid., 9.

[128] Ninety-five percent of Google revenues came from advertising in 2012. Revenues were reported to be $46.0 billion in 2012. Google, "Form 10-K," 2012. Advertising is discussed in more detail in the section "Content Delivery and Business Models" above. As discussed in the section "Expanding Footprints of Digital Industries" above, leading companies with large online presences have business models that encompass a wide range of products and services including communications services (such as email, voice and instant messaging); the production or provision of online content and content aggregation; social networking; e-commerce; and IT hardware.

[129] For example, with Google AdWords text-based ads appear next to search results, along with content on Google or third-party partner websites. Most customers pay Google only when searchers click on the ads, but another option allows advertisers to pay according to the number of times their ads appear. Google, "Form 10-K," 2012.

[130] OECD, "The Economic and Social Role of Internet Intermediaries," April 2010, 18.

[131] Industry representative, interview by Commission staff, Washington, DC, April 22, 2013.

[132] IAB, *Internet Advertising Report: Full Year 2012*, April 2013.

[133] Comscore, *U.S. Digital Future in Focus 2013*, February 2013, 17.

[134] Google, "Form 10-K," 2012.

Mobile devices are causing a shift in search trends. Users increasingly access the Internet over mobile devices at the expense of PCs. Consequently, they are accessing content more frequently through apps, as opposed to navigating through Web browsers and browser-based general-purpose search engines.[135] The total number of general searches declined three percent in 2012, reportedly because of greater use of mobile search platforms and a shift towards more specialized topic-specific searches through other Internet sites.[136] When users navigate directly to such sites, the general-purpose search engines lose traffic. General-purpose search engines also face competition from e-commerce sites and social networks to the extent that users rely on them for product referrals instead of searching generally.

The leading U.S. search engines are also leaders in the global search market based on number of queries, with Google accounting for 65 percent global market share (first place) in December 2012, Yahoo with 5 percent (third), and Microsoft's Bing with 3 percent (fifth). China's Baidu and Russia's Yandex were the second and fourth largest, respectively.[137] Google reported that more than half of its revenue (53 percent) came from outside the United States in 2012, as did its user traffic.[138]

Other Digital Products and Services and Their Influence in the U.S. Economy

The Internet and cloud computing [139] are transforming existing information and communications technology (ICT) services and inspiring the invention of new ones. This section begins with an overview of cloud computing services, and then discusses the impact of the Internet and cloud computing on four broad ICT services—software services, data services, communications services, and computing platform services.

Overview of Cloud Computing Services

The former ICT services business model—enterprise ownership of ICT infrastructure, such as software, data servers, and high-speed computers, combined with contract outsourcing—is shifting toward a new business model that relies more on outsourcing the use of ICT products and services. As the provision of ICT services moves increasingly to the cloud, [140] firms requiring those services no longer have to make significant

[135] Additionally, as consumer habits are different on the smaller screens of mobile devices compared to PCs, advertisers may be willing to pay less for this advertising. Consequently, mobile devices tend to generate less revenue per click than PCs for search engines. Google, "Form 10-K," 2012. Search engines are reported to be working on ways to adapt their advertising campaigns to the mobile environment.

[136] Topic-specific "vertical" searches increased 8 percent from 2011 to 2012. Comscore, *U.S. Digital Future in Focus 2013*, February 2013, 18.

[137] Kerr, "Bing Falls to 5th Global Search Engine," February 7, 2013.

[138] Google, "Form 10-K," 2012. Google reported $46 billion in advertising revenues in 2012, 71 percent of which was from its websites, the other 29 percent from Google Network Member sites. It is unclear exactly how much of this is directly related to search.

[139] There is no conventionally accepted definition of cloud computing. The National Institute of Science and Technology (NIST) defines cloud computing as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." NIST, "The NIST Definition of Cloud Computing," September 2011, 2–3.

[140] One source reports that security and data protection are key reasons why firms may be reluctant to transition to cloud-based products and services. *Economist*, "Interview with Brian Boruff," July 7, 2013.

investments in ICT infrastructure and computing capacity, which are difficult to scale up or down as business conditions change—making cloud services particularly beneficial for SMEs. As a result, the ICT services industry is becoming utility-like in providing an essential commodity or service to the public.

The three main cloud computing services are software-as-a-service (SaaS), infrastructure-as-a-service (IaaS), and platform-as-a-service (PaaS), as described in table 2.5.[141]

TABLE 2.5 Public cloud computing services[a]

Software-as-a-service (SaaS)	
Market size (2012)	$14.4 billion
Forecast CAGR[b] (2011–16)	17.4 percent
Description	Enables use of the provider's applications via Web browser or other interface to access Web-based software. The consumer neither manages nor controls the underlying servers, operating systems, storage, or even application capabilities, with the possible exception of limited user-specific application configuration settings.
Key applications	- Software deployment - Information and knowledge sharing - Communications; social networking
Infrastructure-as-a-service (IaaS)	
Market size (2012)	$6.2 billion
Forecast CAGR[b] (2011–16)	41.7 percent
Description	Provides processing, storage, networks, and other fundamental computing resources. The consumer neither manages nor controls the underlying infrastructure but has control over operating systems, storage, and deployed applications, and possibly limited control of select networking components such as host firewalls.
Key applications	- Mainframes, servers, data storage - IT facility and hosting - Virtual machines (software implementations of computers that execute programs like physical machines) - Load balancers (distribution of workload across multiple computers or other resources to optimize resource utilization)
Platform-as-a-service (PaaS)	
Market size (2012)	$1.2 billion
Forecast CAGR[b] (2011–2016)	26.6 percent
Description	Permits deployment of customer-developed or acquired applications, created with provided programming languages and tools, to the cloud infrastructure. The consumer neither manages nor controls the underlying network, servers, operating systems, or storage, but has control over the deployed applications and possibly over application hosting environment configurations.
Key applications	- Application development, data, workflow - Security services such as single sign-on, authentication - Database management - Directory services

Sources: Government Services Administration, Info.Apps.Gov website (accessed May 29, 2013); Gartner, *Public Cloud Services Forecast 2Q12 Update*, February 8, 2013.

[a] Public cloud computing is open to the public; free email services Gmail and Yahoo mail are examples of public cloud computing. In contrast, private cloud computing is cloud infrastructure operated solely for a single organization on a private network. A company's cloud-based email system is an example of private cloud computing.

[b] CAGR stands for "compound annual growth rate."

[141] The International Telecommunication Union (ITU) recently identified communication-as-a-service (CaaS) and network-as-a-service (NaaS) as new cloud services categories. ITU, "ITU-T Newslog," March 14, 2012.

Software Services Delivered via the Cloud

U.S. spending on software products and services increased from 32 percent of total corporate IT investment in 1990 to almost 60 percent in 2011.[142] Industry revenues from software publishing in the United States are estimated to grow at an average annual rate of 4.3 percent to $189.5 billion during 2008–13, yielding a profit margin of nearly 30 percent.[143] One source anticipates that global spending on enterprise software,[144] a subset of software publishing, will accelerate in 2013–14.[145]

The United States is both the largest market for and the largest producer of software. The U.S. software market accounts for 53 percent of the G8 countries' market and 38 percent of the global market.[146] Roughly 75 percent of the world's largest software companies were founded in the United States, and 18 of the top 25 software companies—in terms of research and development investment—have U.S.-based headquarters. In 2012, the U.S. software publishing industry employed 305,762 people.[147]

Cloud Computing for Software Services

Software-as-a-service (SaaS) is changing the way companies deploy computer software. Until recently, software was installed via a physical medium, such as a CD or DVD, and run locally on PCs hard drive. With broadband Internet, software delivery is increasingly moving from a physical delivery model to a model where remote service applications are delivered on demand via the Internet. SaaS is greatly expanding software, computing, and storage capabilities that were previously limited by hardware size, particularly those of mobile devices. Smartphone and tablet users, for example, can access cloud-based applications and store data on servers at a remote location rather than on the device. Box 2.3 provides an overview of the deployment of SaaS in the economy. Leading SaaS providers include long-standing software development firms such as Oracle and SAP, as well as firms that have entered the industry more recently.[148]

Sources estimate that adoption of SaaS will increase rapidly in the next 3–5 years. One report indicated that global purchases of Internet-delivered software and services rose 17.9 percent in 2011 to $14.4 billion in 2012, and were projected to remain strong through 2015, reaching an estimated $22.1 billion by that time.[149] Industry observers forecast that SaaS delivery will significantly outpace traditional software product delivery, growing nearly five times as fast as the entire software market during 2012–16. SaaS is forecast to comprise 25 percent of all new business software purchases by 2016.[150]

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[142] McKinsey, *Competing in a Digital World,* February 2013.

[143] In addition, research from IBISWorld sees steady growth in software publishing and forecasts industry global revenue to increase to $206.5 billion in 2018. IBISWorld, *Software Publishing in the U.S., Industry Report 51121,* March 2013, 4, 9.

[144] Software used in organizations, such as business and government, as opposed to that used by individuals.

[145] Gartner, *Gartner Says Worldwide IT Spending Forecast*, January 2013.

[146] DataMonitor, *Software in the U.S.*, November 2011, 7.

[147] U.S. Department of Labor, Bureau of Labor Statistics, "Quarterly Census of Employment and Wages," September 2012.

[148] Other leading SaaS providers include Abiquo, Accelops, Akamai, AppDynamics, Apprendra, MeghaWare, Cloud9Analytics, CloudSwitch, CloudTran, Cumulux, Eloqua, FinancialForce, Intact, Marketo, Netsuite, OracleonDemand, Pardot, Salesforce.com, and SAP Business ByDesign. Compiled by USITC.

[149] Infoworld, "Gartner: SaaS Market to Grow 17.9% to $14.5B," March 27, 2012.

[150] IDC, *Worldwide SaaS and Cloud Software,* August, 2012.

BOX 2.3 Software services delivered remotely

Rapid growth in SaaS is being fueled by numerous factors, including:

- globalization (e.g., supply chains and commerce);
- technological progress (e.g., faster broadband, improved security technologies, data centers that have virtualized computing[a] and storage); and
- deregulation (e.g., expanding the availability of radio spectrum for commercial use).

Whether mass-marketed or customized, software developed and delivered over the Internet plays a vital role in many industries in the United States and globally. According to one industry observer, companies that switch to SaaS from physical software are able to reduce infrastructure costs, perform better, and achieve higher productivity.[b] One source reports that more than 50 percent of U.S. companies currently use SaaS in one form or another, while only 15 percent were using it in 2006.[c]

Security and integration concerns made large companies initially reluctant to use SaaS; smaller companies were the primary users at first. However, as the technology has developed and has proven to be increasingly reliable, large and traditional industries, even historically risk-averse ones such as healthcare and finance, are employing SaaS.[d] Uses of Internet technologies, including cloud services, in the financial and healthcare services sectors are discussed in more detail in chapter 3.

[a] Software implementations of computers that execute programs like physical machines.
[b] Cutter Consortium, *Business Technology Trend and Impacts Advisory Service Executive Update*, 2012, 7.
[c] Gartner, *Hype Cycle for Cloud Computing 2012,* August 2012, 8.
[d] Ibid.

SaaS technology is being adopted at different rates across markets and regions. North America is the largest SaaS market (more than $9.1 billion), followed by Europe ($3.2 billion), Asia-Pacific ($934.1 million), and Japan ($495.2 million). The greatest increase in SaaS spending is in the emerging regions of Asia-Pacific (led by Indonesia and India), China, and Latin America (led by Argentina, Mexico, and Brazil), reflecting, among other factors, the growing numbers of mobile device users in those countries.[151] Emerging markets' combined share of global SaaS spending is expected to nearly double by 2016; at that point, SaaS is expected to account for almost 30 percent of the growth of net new spending on public IT cloud services in these markets.[152]

Governments find SaaS technology attractive and are using it to serve the public more quickly, more cost-effectively, and more transparently. Examples of SaaS deployment include the development of e-government services such as online tax filing; renewal of drivers' licenses; and the provision of public health and safety information.[153] Cloud computing is a major feature of the U.S. government's initiative to modernize federal IT operations and reduce costs by replacing expensive and often redundant agency data centers and server farms with Internet-enabled systems. The initiative includes the website *Info.Apps.Gov*, an online catalog where federal IT managers and chief information officers can browse applications and purchase cloud-based IT services developed by companies like Amazon and Salesforce.com for productivity, collaboration, and efficiency.[154]

[151] Gartner, *SaaS Market to Grow 17.9%*, March 2012.
[152] PC Advisor, *IDC: Public IT Cloud Services Spending,* September 11, 2012.
[153] See USA.gov, http://www.usa.gov/Citizen/Services.shtml.
[154] CNET, *White House Unveils Cloud Computing Initiative,* September 15, 2009.

The trend towards increased adoption of SaaS is driving investments in mobile devices and software apps because apps are stored in the cloud and are delivered via wireless Internet. Mobile devices are, in turn, opening new platforms for software companies. One source estimates that 81 billion mobile apps will be downloaded in 2013—double the number in 2012—while another source forecasts app revenue to grow more than 50 percent per year through 2016.[155]

Data Services Delivered via the Cloud

This section describes developments in data processing and data storage, and how IaaS is increasingly being used to outsource these functions. SMEs are a key market for cloud-based data services. Cloud services allow SMEs to benefit from using the latest IT hardware without having to deploy physical infrastructure, like servers and data storage systems, or having to add IT specialists on their payroll.[156] Cloud services are paid for as needed, which may better suit small firms with limited cash on hand to invest in the up-front costs of setting up their own IT infrastructure. Moreover, cloud services are easily scalable, meaning that small businesses may be able to quickly ramp up (or ramp down) their deployment of IT hardware and software using cloud services instead of procuring and managing physical assets themselves.[157]

Data Processing

Cloud computing technologies are making data centers more flexible, more powerful, and much more efficient. The modern data center began in the 1990s, with banks of servers on company premises, and was followed by off-site colocation facilities[158] where companies could house their servers in a variety of spaces, such as private suites or "racks." Today, purpose-built sites typically provide a combination of colocation, managed hosting,[159] and cloud services.[160] Cisco Systems estimates that nearly two-thirds (64 percent) of all data center traffic will be processed in cloud facilities by 2016, rather than in traditional, on-premise data centers. As shown in figure 2.3, data traffic handled by data centers is expected to more than double between 2011 and 2014, with that growth expected to continue through 2016.[161]

The vast amounts of data being generated by Internet-connected devices, along with the growth in data processing services available as a result of cloud computing, are key factors encouraging many industries to study these data using a variety of analytic tools. Often referred to as Big Data analytics (or data analytics), this emerging field of data analysis is increasingly used by companies, utilities, financial institutions, and other economic actors to interpret very large datasets generated through the use of Internet

[155] Gartner, *Market Trends: Mobile App Stores, Worldwide*, 2012; Juniper, *Mobile Apps Briefing 2012–2016*, July 2012.

[156] Lynn, "20 Top Cloud Services for Small Businesses," December 11, 2012.

[157] Cisco, "Cloud: Making SMEs Nimble," n.d. (accessed June 2, 2013); McKinsey & Company, *Winning in the SMB Cloud*, July 2011.

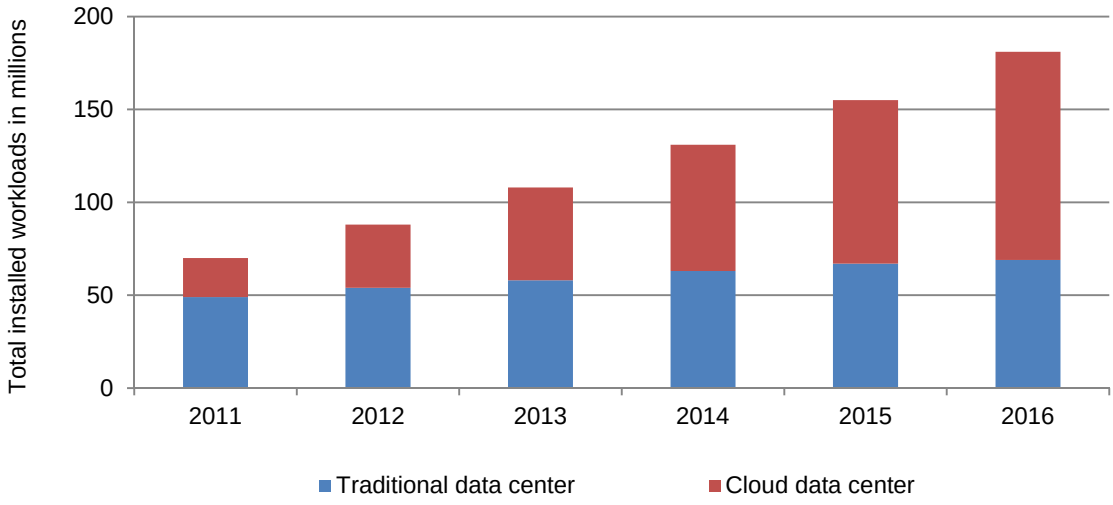
[158] A colocation facility rents space for servers and other computing hardware to businesses.

[159] Managed hosting is an IT provisioning model in which a service provider leases dedicated servers and associated hardware to a single client. The equipment is at the hosting provider's facility and managed there by the service provider.

[160] ZDNet, *The 21st Century Data Center*, April 2, 2013.

[161] Cisco, *Cisco Global Cloud Index. Forecast and Methodology, 2011–2016*, 2012.

FIGURE 2.3 Data traffic: Traditional vs. cloud data center workload distribution, 2011–16 forecast



Source: Cisco Global Cloud Index, 2012.

technologies. Applications of data analytics, as discussed further in box 2.4, include analysis of patterns in social media interactions, retail sales transactions over point-of-sale terminals, energy usage communicated over smart electricity meters, and geographic locations of customers carrying smartphones.

Data Storage

In response to the growing demand for increased data storage capacity, companies such as Amazon, Apple, Dropbox, Evernote, Google, Microsoft, and others are providing businesses and consumers with cloud-based data storage services.[162] These services, briefly described in box 2.5, enable customers to move files once kept on different storage devices, such as hard disks/drives, to the cloud or pool them on the cloud for use as if the individual files were a single entity. Customers can deploy converged private cloud infrastructures at lower cost and then run physical or virtual workloads. Using cloud-based business apps, companies can keep their data safe and accessible from almost anywhere.

[162] *Forbes*, "Amazon and Google at War over Cloud Storage Prices," December 5, 2012.

BOX 2.4 Firms see new opportunities in data analytics

Internet technologies are creating data on a massive scale—data that are constantly changing as a result of online transactions, postings to social networks, reactions to current events, and ever-shifting consumer behaviors and preferences. Increasingly, businesses are looking into ways to analyze these data to provide insight to enhance decision making and to improve design, development, marketing, and sales of their products and services.[a]

The sheer volume of data being produced is enormous. According to one industry official, every two days the world generates a volume of data roughly equivalent in size to the amount of data created between the dawn of civilization and 2003.[b] For example, Walmart's databases reportedly accumulate information on more than 1 million new transactions every hour, and Facebook users reportedly express over 3 billion opinions every day. Cisco forecasts that the number of Internet-connected things generating data will be 25 billion by 2015 and reach 50 billion by 2020.[c]

Data analytics allows companies to capture value from activities that are reported via the Internet. Companies, governments, and other institutions that collect and properly analyze these data will be in a position to acquire knowledge and develop insights necessary to attain competitive advantage. Companies across sectors will be able to draw on operational, consumer, and market data to better understand trends; more quickly get to market; and increase profits. Governments will be able to craft more effective public policies and operate more efficiently. A recent survey of IT professionals showed that most believe that Big Data analytics will increase global competitiveness.

Recognizing the potential of data analytics to unleash a wave of productivity and growth, the U.S. government launched the Big Data Research and Data Initiative in 2012. Comprising several federal departments and agencies, including the National Science Foundation, National Institutes of Health, Department of Defense, Department of Energy, and U.S. Geological Survey, it commits more than $200 million to data analytics research projects. The initiative aims to:

- advance the state-of-the-art core technologies needed to collect, store, preserve, manage, analyze and share huge quantities of data;
- harness these technologies to accelerate the pace of discovery in science and engineering, strengthen national security, and transform teaching and learning; and
- analyze and share massive quantities of data.[d]

Studies confirm that the ability to draw on vast amounts of data could have a major impact. Research has shown that companies that use data-directed decision making (defined not only by collecting data, but also by how it is used—or not—in making crucial decisions) achieve productivity gains of 5–6 percent.[e] Another study found that over 70 percent of the organizations that collected, analyzed and properly applied data findings gained benefits. They reported, among other gains, higher productivity; reduced risk; faster decision-making; and better financial performance.[f] Another report estimates that U.S. healthcare could use Big Data analytics to improve productivity by almost 1 percent annually over the next decade, creating potential value of more than $300 billion.[g]

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[a] Gartner, "IT Glossary," n.d. (accessed May 5, 2013).

[b] Eric Schmidt, Google chief executive officer, cited in Economist Intelligence Unit, *Big Data: Lessons from the Leaders*, 2012, 3.

[c] Evans, *The Internet of Things,* April 2011, 3.

[d] John P. Holdren, director of the White House Office of Science and Technology Policy, cited in White House, "Obama Administration Unveils 'Big Data' Initiative," March 29, 2012;.White House, "Obama Administration Unveils 'Big Data' Initiative," March 29, 2012.

[e] Economist Intelligence Unit, *Big Data: Harnessing a Game Changing Asset,* 2012, 2.

[f] Harvard, *The Evolution of Decision Making,* 2012, 2.

[g] McKinsey Global Institute, *Internet Matters,* 2012, 37.

BOX 2.5 Data storage moves to the cloud

Storage of email, documents, databases, graphic files, and spreadsheets created by both firms and individuals is changing as it migrates from hard disks/drives and commercial devices (the latter are expensive and require skilled maintenance) to the cloud. In addition to the rapid growth noted earlier in volume of data generated, the need for larger, more sophisticated storage capacity arises from several factors, including federal government regulations that require businesses to maintain and back up a variety of data which they might otherwise have deleted.[a] Antivirus and anti-spyware software are becoming increasingly necessary for security reasons, and they are very storage-intensive. The vast range of software apps and operating systems available continues to increase at an accelerating rate. In addition, the content industries have a growing need to store large media files (especially video) and make them available to users.[b]

The expanding need for data storage is increasingly being met by cloud technologies and virtualization,[c] which create an almost limitless ability to store data. Even though, with new technologies, the cost per terabyte (equivalent to 2,000 scanned file cabinets) of storage has declined from $1 million in 1992 to $6.42 in 2012,[d] storage is forecast to increase as a share of data center systems spending from 19 percent in 2011 to 24 percent in 2018.[e] The increased share of spending reflects exponential growth in data volumes and therefore demand for storage.

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[a] Hardison and Pashkoff, *An Assessment of the PCAOB's Enforcement Program*, January 10, 2012.
[b] Gartner, *Worldwide IT Spending Forecast to Reach $3.7 Trillion,* January 2013.
[c] Software implementations of computers that execute programs like physical machines.
[d] *Gilheany, The Decline of Magnet Disk Storage Cost* (accessed May 3, 2013), 1.
[e] Economist Intelligence Unit, *Big Data,* 2012, 3.

Cloud Computing for Data Services

Companies use IaaS to outsource the IT equipment and operating environment they use to support their operations, including hardware, networking, and databases, as described in box 2.6. As the fastest-growing segment of the public cloud market, IaaS is likely to accelerate with the increasing adoption of cloud computing. IaaS had a market size of $6.2 billion in 2012, and sources estimate that IaaS spending will reach $24.4 billion by 2016.[163]

Amazon Web Services and Rackspace are the largest and second-largest providers of IaaS, respectively.[164] Rackspace has roughly one-tenth of the IaaS business of Amazon Web Services, but it is gaining share with OpenStack, an open-source cloud computing

BOX 2.6 Outsourcing IT equipment and operating environment to the cloud

Companies that provide IT outsourcing resources (IaaS providers) own large numbers of computers—physical as well as virtual machines—in data centers. IaaS providers are responsible for hosting, running, and maintaining these and other resources. Clients rent the computational infrastructure and services and typically pay on a utility basis according to the resources allocated and consumed. Because of its ability to rapidly extend or scale back information technology according to clients' individual needs, IaaS is sometimes referred to as "hardware-on-demand." Clients can, for example, offload tasks to the provider when the most computing resources are needed, and thereby avoid investing in servers that would run at capacity two or three times per year and operate at a low load the rest of the time.

Source: Oracle, "Executive Brief," 2013.

[163] Gartner, *Forecast Overview: Public Cloud Services,* February 8, 2013.
[164] Other leading IaaS providers include AT&T, Blue Lock, CA Technologies, Cloudscaling, Datapipe, ENKI, Enomaly, Eucalyptus Systems, GoGrid, HP, Joyent, Layered Tech, Logicworks, Navisite, Opsource, Savvis, and Terremark. Compiled by USITC.

platform. Dell, HP, and Intel use OpenStack and, in March 2013, IBM announced that all of its future cloud services and software will run on it.[165] Growth is so rapid that Rackspace announced the launch of a certification program in 2013 to teach the skills necessary to run applications on a cloud-based server infrastructure.[166]

Communications Services Delivered via the Internet

This section describes communications services provided via the Internet, including email, instant messaging, and Voice over Internet Protocol (VoIP). Increasingly, companies are outsourcing the IT infrastructure used to provide these services to the cloud—another example of the use of IaaS. For example, instead of procuring and managing their own servers, companies can use "virtual servers" (servers accessed via the Internet) to provide their email or other Internet-based communications services.

Email

Email is evolving as cloud technology expands its usages and capabilities.[167] Cloud-based email, particularly when accessed from mobile devices, allows users to be constantly connected with email service. Once thought of as primarily a business service, many free consumer-oriented email services allow users to access their email from all of their Internet-connected devices, such as smartphones and tablets. Users have access to their email from any PC or Internet-connected device.[168] As a cloud-based application, when a new email is received or the user deletes an email, the changes are reflected on all of the user's devices.[169]

Instant Messaging

Instant messaging between two or more participants over the Internet differs from email due to the perceived synchronicity of the communication. Facebook Chat, Google Talk, Yahoo Messenger, and Twitter are forms of instant messaging systems. Cloud-enabled features, such as anywhere, anytime service, are making instant messaging increasingly popular. Mobile technology allows instant messaging services to be accessed from portable devices ranging from standard mobile phones to smartphones and tablets. While popular for casual consumer use, tens of millions of instant messaging accounts are being used for business purposes by companies.[170]

Voice over Internet Protocol

VoIP refers to Internet-delivered communications and multimedia.[171] Businesses and governments are increasingly turning to VoIP applications in the workplace as a lower-cost alternative to traditional land line telecommunications. For example, Skype, which originally marketed itself as a consumer-oriented service providing free voice and video

[165] Hesseldahl, *IBM Makes a Big Bet*, March 4, 2013.

[166] Lev-Ram, *How Rackspace is Taking On Amazon Now*, March 20, 2013.

[167] Gillis, "A Fresh Sheet of Paper," March 18, 2013; Schaeffner, "Driving E-Mail to the Cloud," May 12, 2010.

[168] iCloud, *Calendar, Contacts and Mail*, 2013.

[169] Bradley, "The Cloud, Day 7: Email in the Cloud," November 17, 2011.

[170] EcomStor and InterpriStor, *Mobile Instant Messaging*, 2013; *Economist*, "Instant Messaging Joins the Firm," June 20, 2002.

[171] Fueled by cloud services, free and convenient VoIP is increasingly available on mobile devices such as smartphones and tablets. Deployment of the WiMAX network—a wireless digital communications system—is likely to further advance mobile VoIP into mainstream mobile telecommunications. Library Technology Reports, *Protocol IP Phones, Software VoIP, and Integrated Mobile VoIP*, 2010, 18.

connections between users on its network, now markets several fee-based business-oriented services.[172]

Many VoIP solutions aimed at businesses have evolved into unified communications (UC) services that treat all communications—phone calls, faxes, voice mail, email, web conferences, and more—as discrete units that can all be delivered via any means and to any mobile device, including cellphones. The U.S. Social Security Administration is converting its field offices of 63,000 workers from traditional phone installations to a VoIP infrastructure carried over its existing data network.[173] As one industry observer describes it, "The market for VoIP services has moved well beyond the early adopter stage to mainstream status in many developed countries."[174]

Computing Platform Services Delivered via the Cloud

Organizations that outsource their ICT infrastructure—servers, storage, and other services—to the cloud may need a platform on which to create, deploy, and manage their work. PaaS provides an outsourced environment for application development and management.[175] Clients use the PaaS provider's networks, servers, and storage to create and run applications over the Internet for a fee.

PaaS enables users to realize cost savings and efficiencies while modernizing and expanding their IT capabilities without buying infrastructure.[176] The ability to access services and capacity that might otherwise be unavailable or cost prohibitive, while paying only for the actual resources consumed (usually priced per hour), is increasingly popular, particularly among small businesses.[177] Many businesses have adopted PaaS solutions like Microsoft Windows Azure for its scalability and ease of use. One source estimates that the market for PaaS is set to grow from $1.2 billion in January 2012, to $2.9 billion in 2016. At this projected rate, PaaS is reportedly set to generate an additional $360 million in revenue annually between 2011 and 2016.[178]

[172] Skype, *Using Skype in Your Business,* 2013.
[173] *FedTech Magazine,* "SSA Chooses VoIP to Span the Agency," December 31, 2009.
[174] *Wall Street Journal,* "Infonetics, VoIP Market Getting Boost," April 22, 2013.
[175] For example, Microsoft describes its PaaS as delivering "cloud-based application development tools, in addition to services for testing, deploying, collaborating on, hosting, and maintaining applications" (Microsoft, "Cloud Computing," 2012); Oracle describes its PaaS as providing "a shared and elastically scalable platform for consolidation of existing applications and new application development and deployment" (Oracle, "Oracle Cloud Platform," 2013); and Salesforce describes its PaaS as "a proven model for running applications without the hassle of maintaining the hardware and software infrastructure at your company" (Salesforce.com, "What is PaaS?" 2013).
[176] PaaS vendors provide a computing platform that usually includes an operating system, a programming language execution environment, databases, and Web servers. Some providers also include facilities for design, development, testing, and deployment, as well as for team collaboration, Web service integration, and security. Leading PaaS vendors include AmazonWebServices, Appistry, App Scale, CA Technologies, Engine Yard, Flexiscale, gCloud3, GigaSpaces, GoogleAppEngine, GridGain, LongJump, Microsoft WindowsAzure, OpenStack, Orangescape, OS33, Outsystems, Rightscale, Salesforce, and ThinkGrid. Compiled by USITC.
[177] Tech Target, "The Battle for Cloud Services," n.d. (accessed April 18, 2013).
[178] Columbus, "Gartner Predicts Infrastructure Services Will Accelerate," February 19, 2013.

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CHAPTER 3
Digital Trade in the U.S. Economy: Uses of Internet Technologies in the Broader Economy

The Internet has transformed how most services in the U.S. economy are produced and delivered. The Internet and Internet technologies (also referred to as digital technologies) are being used to communicate with customers in addition to, or in place of, face-to-face interaction. These technologies have also fundamentally changed how firms in almost all industries design, develop, produce, market, and deliver products and services. Digital technologies enable deeper analysis of customer requirements, more detailed and more timely monitoring of the production process, and greater geographic dispersion of the value chain.

This chapter discusses the role and impact of digital technologies across a wide range of economic sectors in the U.S. economy. It begins by briefly describing the incidence of digital intensity (i.e., the degree to which firms have adopted digital technologies) and the competitive rationales firms have for adopting digital technologies. The chapter then describes how digital technologies are transforming customer interface and back-end operations in selected services industries shown in table 3.1.

TABLE 3.1 Digital trade: Products and services highlighted in this chapter

Digital trade by category	Products and services included in category
Selected services industries examined in this report	• Retail and e-commerce • Financial services • Professional services (including legal services and architectural and engineering services) • Healthcare services • Selected other services (express delivery services and online education services)

Note: An overview of all of the products and services covered in this report is provided in table 1.1.

Digital Intensity of Industry Sectors and the Competitive Rationales for Adopting Internet Technologies

Businesses throughout the U.S. economy use Internet technologies to produce and deliver products and services, and to communicate with customers throughout the process. However, different industry sectors have adopted these technologies to varying degrees—for example, because their products are now sold online, or because their production control processes are moving to Internet technologies, such as cloud computing.[1] Firms

[1] Cloud computing refers to the delivery of software and other computer services via the Internet. Cloud computing is discussed in more detail in chapter 2 in the section "Other Digital Products and Services and Their Influence in the U.S. Economy."

in industry sectors that rank high in terms of digital intensity are moving quickly to adopt Internet technologies in order to lower costs, increase efficiency, offer products and services through a variety of channels, and improve customer interactions. As might be expected, the information sector—which includes the provision of digital products and services, as described in chapter 2—has typically been an early adopter of Internet technologies.

Rankings of Digital Intensity of Industry Sectors

There are many ways to measure digital intensity—the degree to which firms in a given industry sector have adopted Internet technologies in their businesses. Some useful indicators of digital intensity are the proportion of online sales (e-commerce); the share of total input purchases that are information technology (IT)-related; the proportion of employees in digital occupations; and the share of total IT spending directed to cloud services. Industry sector rankings for each of these indicators are shown in tables 3.2–3.5.

One obvious indicator of digital intensity is the degree to which sales are transacted online. The U.S. Census Bureau publishes e-commerce statistics for U.S. industries, and its 2010 data (the latest year available) highlight the importance of business-to-business (B2B) e-commerce in the manufacturing supply chain and wholesale trade (table 3.2.) Travel arrangements and reservations is another sector where customer sales have moved online to a significant extent. Internet technologies are also quickly transforming how consumers do their shopping and banking, as well as how they purchase information and entertainment.

TABLE 3.2 Industry sector rankings: E-commerce as a percent of total revenue of U.S. firms, selected industry sectors, 2010

Major industry sector	Industry sector or subsector	Percent of revenue
Manufacturing	Manufacturing shipments	46.4
Wholesale trade	Wholesale trade sales	24.6
Travel and accommodation	Travel arrangement and reservation services	22.5
Information	Internet service providers and web search portals	21.3
Financial services	Bank lending	9.3
	Rental and leasing services	8.5
Information	Publishing industries (except Internet)	8.3
Transportation and logistics	Transportation and warehousing	8.1
Education	Educational services	7.6
Retail trade	Retail trade sales	4.4
Financial services	Securities intermediation and broking	4.1
Travel and accommodation	Accommodation and food services	3.0
Information	Computer systems design and related services	2.0
Utilities	Utilities	0.2
Healthcare	Health care and social assistance	0.2

Source: U.S. Census Bureau, *E-Stats*, May 10, 2012.
Note: Similar colors indicate the grouping of subsectors within major sectors—for example, information industries, business and professional services, financial services, wholesale trade, and retail trade.

A second indicator of digital intensity is the share of information and communications technology (ICT) goods and services in an industry's total purchases of intermediate

inputs.[2] As might be expected, the information industries rank highest according to this metric, but the federal government and the manufacturing sector are also major purchasers of ICT inputs (table 3.3).

TABLE 3.3 Industry sector rankings: Digital/IT inputs as a percent of total intermediate inputs, 2011

Major industry sector	Industry sector or subsector	%
Information	Broadcasting and telecommunications	36.2
Government	Federal general government	25.6
Manufacturing	Manufacturing-Other transportation equipment	14.4
Financial services	Securities services	13.9
Professional services	Legal services	12.7
	Management of companies and enterprises	11.5
Natural resources	Mining, except oil and gas	9.0
Wholesale trade	Wholesale trade	7.3
Education	Educational services	6.7
Retail trade	Retail trade	5.2
Travel and accommodation	Accommodation	5.1
Healthcare	Ambulatory health care services	4.9
Financial services	Banking	4.8
Transportation and logistics	Rail transportation	4.3
Arts and recreation	Amusements, gambling, and recreation industries	3.6
Financial services	Insurance	2.8
Construction	Construction	2.6
Utilities	Utilities	0.9
Agriculture	Agriculture, Forestry, Fishing and Hunting	0.4

Source: BEA, Input-Output Tables, 2011.

A third indicator of digital intensity is the percentage of employees in ICT occupations,[3] which may indicate the degree to which an industry firms use digital technologies within the company (table 3.4). Again, the information sector ranks highest, but the professional, business, and technical services industries also rank highly, followed by company management services and financial services.[4]

A fourth indicator of digital intensity is the percentage of IT spending that is for public IT cloud services (table 3.5).[5] Professional services and insurance are leading sectors here; about 5 percent of their total IT spending goes to purchase public cloud services. One caveat is that, according to these data, the securities and banking sectors appear to be making less of an investment in cloud technologies. This conclusion is likely to be incorrect, however, given that most banks will need to use private rather than public cloud services because of their data protection responsibilities.[6]

[2] In this calculation, ICT intermediate inputs include purchases of computer and electronic products, broadcasting and telecommunications, information and data processing services, and computer systems design and related services. Only purchases from external suppliers are included. USDOC, BEA, Input-Output Tables, 2011.

[3] Occupations categorized as ICT-related in this calculation included computer and information system managers (SOC 11-3020), all computer occupations (SOC 15-11), and computer hardware engineers (SOC 17-2060). BLS, Occupational Employment Statistics, n.d. (accessed March 20, 2013).

[4] As noted in table 3.1, legal services and architectural, construction, and engineering services are included in professional services.

[5] Roughly half of all cloud services provided are public cloud services, while the remainder are either private cloud services or a hybrid of the two (see chapter 2 for more discussion of types of cloud computing services).

[6] IDC, "U.S. Public IT Cloud Services by Industry," December 2010, quoted in Gantz, Minton, and Toncheva, "Cloud Computing's Role in Job Creation," March 2012, 5.

TABLE 3.4 Industry sector rankings: Digital/IT occupational shares by employer sector, using BLS occupational data, 2011

Major industry sector	Industry sector or subsector	%
Information	Information industries	19.0
Professional services	Professional, scientific, and technical services	18.0
	Management of companies and enterprises	12.1
Financial services	Finance and insurance	6.3
Wholesale trade	Wholesale trade	4.4
Manufacturing	Manufacturing	3.2
Utilities	Utilities	2.9
Government	Federal, state, and local government	2.7
Education	Educational services	1.8
Natural resources	Mining	0.9
Healthcare	Health care and social assistance	0.7
Transportation and logistics	Transportation and warehousing	0.7
Retail trade	Retail trade	0.6
Arts and recreation	Arts, entertainment, and recreation	0.6
Construction	Construction	0.2
Agriculture	Agriculture, forestry, fishing and hunting	0.1
Travel and accommodation	Accommodation and food services	0.0

Source: U.S. Bureau of Labor Statistics, Occupational Survey 2011.

TABLE 3.5 Cloud computing "intensity": U.S. spending on public IT cloud services as a percentage of IT spending, by sector, 2011

Major industry sector	Industry sector or subsector	%
Professional services	Professional services	5.3
Financial services	Insurance	4.4
Transportation and logistics	Transportation	4.3
Construction	Construction	2.6
Education	Education	3.8
Manufacturing	Process manufacturing	3.7
Financial services	Securities and investment services	3.7
Retail trade	Retail	3.7
Natural resources	Resource industries	3.2
Financial services	Banking	3.0
Manufacturing	Discrete manufacturing	2.8
Information	Communications and media	2.8
Healthcare	Healthcare	2.7
Wholesale trade	Wholesale	2.5
Utilities	Utilities	2.3
Government	Government	1.3

Source: IDC, "U.S. Public IT Cloud Services by Industry," December 2010.

Professional services, financial services, wholesale and retail trade, healthcare, and education are all sectors where the business opportunities afforded by Internet technologies are significant. Digital technologies have transformed business practices differently in different industry sectors. The four measures of digital intensity discussed above look at various aspects of firms' use of digital technologies to improve production or sales or both. Each measure has a slightly different focus, but the rankings are fairly consistent. Taken together, the measures give a good indication of which industry sectors have changed or are changing most significantly. Comments from industry participants also emphasize the importance of Internet technologies for the information sector, retail trade, financial services, education and healthcare services, as well as the manufacturing and government sectors (table 3.6).

TABLE 3.6 Oxford Economics Industry survey: Industries likely to be most affected by digital transformation
In your view, which of the following business sectors will be most transformed (for the better) by information technology over the next 5 years? (percentage stating "greatly transformed")

Major industry sector	Industry sector or subsector	%
Information	IT and technology	72.0
	Telecommunications	66.0
	Entertainment, media and publishing	65.0
Retail trade	Retailing and consumer products	48.0
Financial services	Retail and commercial banking	47.0
Life sciences	Life sciences	38.0
Education	Education	38.0
Financial services	Capital markets	33.0
	Asset management	30.0
	Insurance	27.0
	Other	24.0
Healthcare	Healthcare services	24.0
Manufacturing	Manufacturing	23.0
Government	Government/public sector	17.0

Source: Oxford Economics, "The New Digital Economy," June 2011, 10.

Note to tables 3.2-3.6: Similar colors indicate the grouping of subsectors within major sectors—for example, information industries, business and professional services, financial services, and wholesale and retail trade. As the various measures aggregate subsectors slightly differently, the specific titles have been retained.

Competitive Rationales for Adopting Digital Technologies in Various Industry Sectors

Rankings of digital intensity reflect how firms in different industry sectors have adopted Internet technologies in response to competitive factors. Manufacturing, as well as retail services, financial services, professional services, and healthcare—the service industries reviewed in more detail below—all show some degree of digital intensity because firms in these sectors typically respond quickly to competitive pressures to lower costs, increase efficiency, offer products and services through a variety of channels, and improve customer interactions. According to one report, the banking and retail service sectors and high-tech manufacturing have moved furthest toward incorporating Internet technologies throughout their businesses. In the process, they have enhanced customer engagement and improved their capacity for analyzing sales trends.[7]

Several competitive considerations drive firms to adopt and integrate Internet technologies. Firms adopt new technologies in order to gain competitive advantage over non-innovating firms, or just to keep up with industry wide changes in standard practice. Competitive factors include the desire for more efficient management of production inputs, the production process, and product delivery, as well the need to respond to changes in consumer preferences.

A variety of Internet technologies help firms lower costs and achieve efficiency gains. These include location-based tracking, online ordering and other types of B2B and business-to-consumer (B2C) e-commerce, wireless machine-to-machine (M2M)

[7] Cap Gemini Consulting and the MIT Center for Digital Business, "The Digital Advantage," November 5, 2012, 7.

communications, Big Data analytics,[8] and all aspects of cloud computing services.[9] Box 3.1 describes how companies are using the Internet of Things.

BOX 3.1 The Internet of Things

Digital products and services are increasing connectivity around the world in every sector. One report estimates that 50 billion devices will connect to the Internet by 2020.[a] These connections—to the Internet, people, and other objects—are tools for understanding and responding to complexity. Cloud computing has created the application and device-management backbone necessary to scale and support billions of Internet-connected objects, together known as "the Internet of Things."

Machine-to-machine (M2M) connections generate vast amounts of data (they are a key source of Big Data) which, if analyzed quickly and accurately, provide producers with important insights into how they can reduce waste and improve efficiency. Objects are being fitted with sensors that communicate with the sensors on other objects and with remote data servers in the cloud. Cloud computing offers smaller firms the capacity to process large and complex datasets quickly and at reasonable cost. Data analytics help producers and service providers to fine-tune the operations of many devices, from pacemakers to thermostats.[b]

Business has recognized the potential of networked devices to help manage and improve processes; the healthcare, automotive, and home appliances sectors have been among the early adaptors:

- GE is installing sensors on objects ranging from hospital beds to gas turbines to washing machines. For the past few years, GE has worked with Mt. Sinai Medical Center in New York to improve operations of the 1,100 bed-hospital. Upon checking in, patients receive sensor-embedded wristbands that track their location and provide necessary information. The sensors give details about illnesses, medical resources, and treatment protocols for individual patients as well as the overall hospital population. The data is aggregated to automate and streamline operations and facilitate informed decision making.[c]

- GM's OnStar wireless calling, assistance, and theft control features are already popular in the automotive sector.

- Auto insurers are introducing services in which insurance premiums can be linked to information obtained from devices installed in vehicles that monitor events such as the number of sudden brakes and other driving habits of policyholders.

- In the city of Groningen in the Netherlands, Vodafone has put sensors on trash containers to alert trash haulers when the containers need to be emptied, saving on unnecessary trips and reducing fuel use.

- In January 2013, AT&T and Qualcomm announced a joint project called the "Internet of Everything Development Platform" to more speedily get Internet-connected goods into the market. Also, experienced M2M communications providers such as Cosm, Numerex, and KORETelematics, as well as consumer- or enterprise-focused companies such as Google and BlackBerry, have software platforms that could provide capability to integrate items like home utilities and automobile features on the Internet.[d]

The potential impact of the Internet of Things on business, government, and people is considerable, with one source valuing the global impact of the Internet of Things at $4.5 trillion.[e] Cisco projects that the Internet of Things has the potential to grow global corporate profits by 21 percent in the aggregate by 2022, as companies find new revenue streams, adopt new business models, gain efficiency savings, and improve the delivery of existing services.[f]

[a] Ericsson, "More than 50 Billion Connected Devices," February 2011, 3.
[b] Ibid., 4.
[c] Lohr, "Looking to Industry for the Next Digital Disruption," November 23, 2012.
[d] Svensson, "The Wireless Revolution," February 27, 2013.
[e] GSMA, "The Connected Life," February 2012, 2.
[f] King, "Cisco Pegs Potential Profit Value of Internet of Everything," March 13, 2013.

[8] Big Data analytics refers to analyzing the large volumes of data being generated by Internet-connected devices as a result of online transactions, postings to social networks, reactions to current events, and constantly shifting consumer behaviors and preferences. Big Data analytics is described in further detail in chapter 2.

[9] Cloud computing services are discussed in more detail in chapter 2.

Internet technologies also provide consumers with more convenience and more efficient service. Internet connectivity has become an important tool for reaching and interacting with customers. Consumers are able to access products and services at any time through online or mobile Internet connections, as well as through more traditional channels (in-store or by telephone). At the same time, Internet technologies including cloud computing, search engines, and social media allow firms and consumers to benefit from more frequent and better-quality interactions.

Table 3.7 outlines the competitive rationales for firms to adopt Internet technologies and the benefits for both producers and consumers. Appendix F provides more detailed examples of how firms in various sectors apply Internet technologies in response to these competitive forces.

TABLE 3.7 How adopting Internet technologies benefits producers and consumers

	Benefits of Internet technologies	Sector examples
Producers: How Internet technologies enable firms to lower costs and improve efficiency	• Globalization of supply chains and increased e-commerce is enabled by efficient logistics • Cloud computing can help to make production and supply chain management more efficient • Data analytics and the Internet of Things combine to enable more efficient management of resources • Services can be delivered more efficiently in a networked enterprise • Data- and transaction-intensive industries can achieve lower costs through cloud computing	• Manufacturing B2B e-commerce retail trade, logistics, and wholesale trade and distribution • Manufacturing and assembly operations, retail trade, and various industries • Professional services, buildings and property management, manufacturing • Professional services (including architecture and engineering services) and healthcare services • Banking, securities trading and broking, insurance, and energy exploration
Consumers: How Internet technologies bring consumer benefits from new channels for service delivery, and benefits for both firms and consumers from more and better interaction	• Consumers like multichannel, 24/7 access to goods and services through traditional, online, and mobile services • Online aggregators make it easier for consumers to research and transact their purchases • Social media are used to gather feedback from consumers and to conduct market research • Data analytics and M2M digital networks help producers to tailor products to customer preferences and achieve more efficient pricing	• Banking and investment management, content industries, education, government, and retail trade • Banking, insurance, retail trade, travel arrangements, and food and accommodation • Financial services, insurance, retail trade, and consumer goods manufacturing • Financial services, retail trade, government services, healthcare, insurance, and utilities

Source: Compiled by USITC.

Note: Appendix F provides more detailed examples of how firms in various sectors apply Internet technologies in response to competitive forces.

Digitally Enabled Services

This section describes how Internet technologies are transforming customer interface and backend operations in selected service industries: retail services, logistics (express delivery services), financial services, professional services, healthcare, and education services. The highlighted industries are innovators in the use of Internet technologies and are sectors for which the United States is globally competitive.

Retail and E-commerce

Internet technologies have transformed all aspects of the retail sector, including marketing, distribution, sales, customer service, and payments. Consumers are increasingly using Internet technologies such as personal computers (PCs), smartphones, and tablets to research and shop for products and services online. Retailers are adapting to the new Internet-oriented retail space, embracing new technologies to serve their increasingly Internet-connected clientele, and using Internet technologies to gain efficiency in their backend operations, including business logistics.

Internet technologies have led to explosive growth in e-commerce.[10] Globally, an estimated $8 trillion is transacted annually through online channels.[11] The overwhelming majority of such sales are B2B transactions in the manufacturing and wholesale distribution sectors. In the United States, total e-commerce transactions accounted for approximately $4 trillion in 2010, also primarily B2B trade (latest available U.S. data).[12]

B2C Online Retail Sales

Online B2C retail sales account for a small but steadily growing portion of total U.S. e-commerce and are gaining an increasing share of total U.S. retail sales. Globally, e-commerce B2C retail sales were estimated at $821 billion in 2012 and were forecast to increase to $963 billion in 2013, more than doubling since 2010.[13] In 2010, U.S. e-commerce retail transactions (e-sales) were $169.0 billion, or 4.4 percent of the $3.8 trillion U.S. retail market (latest U.S government data) (table 3.8).[14] Retail e-sales grew by 18 percent annually during 2002–10 in comparison to 2.6 percent for total retail sales.[15] Non-store retailers, primarily electronic shopping and mail-order businesses (NAICS code 4541), accounted for over three-quarters of U.S. e-sales in 2010.[16]

For electronic shopping and mail-order houses, leading e-commerce goods categories in 2010 were clothing and clothing accessories, including footwear ($23.2 billion); electronics and appliances ($17.5 billion); furniture and home furnishings ($11.9 billion);

[10] The Census Bureau defines e-commerce as "any transaction completed over a computer-mediated network that involves the transfer of ownership or rights to use goods or services." Although online purchases of physical goods are not included in digital trade, as defined in this report, the recent increase in e-commerce is nevertheless a significant example of the retail services sector's adoption of Internet technologies, and therefore is discussed here. USDOC, Census Bureau, "Measuring Electronic Business," n.d. (accessed June 15, 2013).

[11] McKinsey Global Institute, *Internet Matters*, May 2011, 1.

[12] Primarily manufacturing and wholesale trade e-commerce. USDOC, Census Bureau , "E-Stats," May 12, 2012.

[13] Goldman Sachs, *Nothing but Net: 2011 Internet Investment Guide*, 2011, cited in Internet Retailer, "Global E-Commerce Sales," September 11, 2011.

[14] USDOC, Census Bureau, "E-stats," table 5, "U.S. Retail Trade Sales—Total and E-commerce: 2010 and 2009," n.d.

[15] USDOC, Census Bureau, "E-Stats," May 12, 2012, 3.

[16] These were catalog and mail-order businesses, Internet-only retailers, and e-commerce units of traditional brick-and-mortar stores. NAICS classification 4541: "This industry comprises establishments primarily engaged in retailing all types of merchandise using non-store means, such as catalogs, toll free telephone numbers, or electronic media, such as interactive television or computer. Included in this industry are establishments primarily engaged in retailing from catalog showrooms of mail-order houses." USDOC, Census Bureau, Industry Statistics Sampler (accessed March 30, 2013).

TABLE 3.8 U.S. retail trade sales: Total and e-commerce, 2010 (million $)

	Total	E-commerce	E-commerce as a share of total sales (%)
Non-store retailers	341,189	135,572	39.7
Electronic shopping and mail-order houses	260,557	131,786	50.6
Motor vehicles and parts dealers	746,924	20,561	2.8
Clothing and clothing accessories stores	213,735	3,469	1.6
Miscellaneous store retailers	106,514	2,504	2.4
Sporting goods, hobby, book, and music stores	81,620	2,192	2.7
Electronics and appliance stores	99,152	1,049	1.1
Other	2,252,396	1,927	0.1
Total retail trade	3,841,530	168,965	4.4

Source: USDOC, Census Bureau, "E-stats."

And computer hardware ($11.4 billion), which includes smartphones and tablets (table 3.9). Almost 90 percent of music and videos sold by these retailers were sold online in 2010, and more than 80 percent of electronics and appliances, as well as books and magazines, were sold online. A 2010 survey of global online consumers reported that books, apparel and accessories, and airline tickets were the leading products purchased online.[17]

TABLE 3.9 U.S. sales by electronic shopping and mail-order houses, by type: Total and e-commerce, 2010 (million $)

	Total	E-commerce	E-commerce as a share of total sales (%)
Clothing and clothing accessories (includes footwear)	29,510	23,157	78.5
Electronics and appliances	21,259	17,462	82.1
Furniture and home furnishings	15,182	11,882	78.3
Computer hardware	24,187	11,421	47.2
Drugs, health aids, and beauty aids	78,341	7,220	9.2
Books and magazines	7,536	6,231	82.7
Music and videos	6,872	6,042	87.9
Sporting goods	7,785	5,741	73.4
Office equipment and supplies	7,190	5,343	74.3
Toys, hobby goods, and games	6,656	4,395	66.0
Computer software	6,078	3,315	54.5
Food, beer, and wine	3,819	2,391	62.6
Other merchandise	32,094	17,048	53.1
Nonmerchandise receipts	14,048	10,138	72.2
Total electronic shopping and mail-order houses (NAICS 4541)	260,557	131,786	50.6

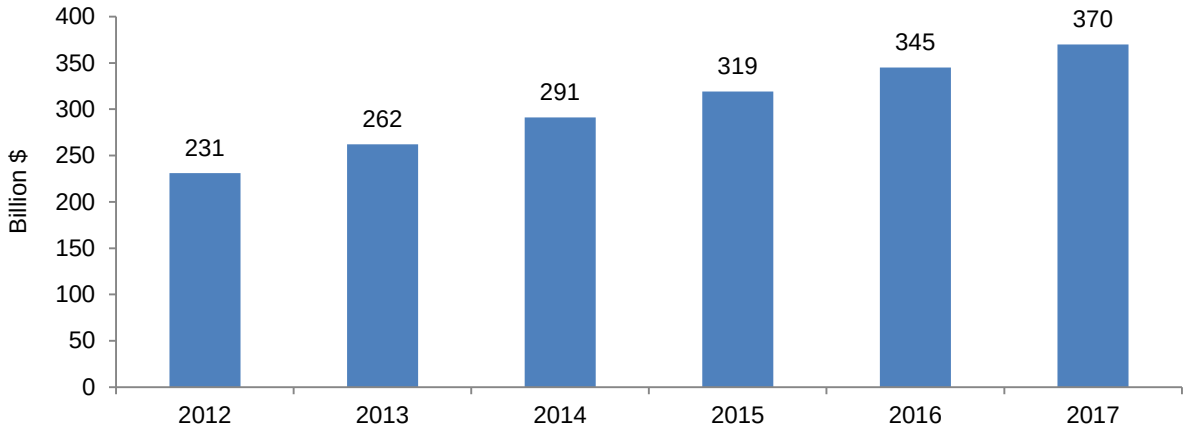
Source: USDOC, Census Bureau, "E-stats."

Sales of Digitally Delivered Content

As discussed in chapter 2, the fastest-growing categories for U.S. e-commerce sales in 2012 were online content downloads, including music, games, videos, and e-books, which were aided by surging mobile Internet use via smartphones and tablets. Figure 3.1 illustrates projected growth in U.S. online sales.

[17] Nielsen, "Global Trends in Online Shopping," June 2010, 2.

FIGURE 3.1 U.S. online retail sales are projected to increase rapidly through 2017



Source: Forrester Research.

Online Payments Systems

Internet and cloud-based financial payment systems are challenging traditional payment methods for both e-commerce and brick-and-mortar stores. Three leading types of online payments systems are credit cards, nonbank Internet payment systems, and digital wallets:

- **Credit cards.** Banks are the core providers to end users for most online retail payment instruments and services, and payments for Internet transactions are largely conducted through credit cards. Visa and MasterCard are the primary credit card payment instruments used by individuals making online purchases.[18]

- **Nonbank Internet payment systems.** PayPal, an eBay subsidiary, is the most widely used non-bank Internet payment system. PayPal serves as a financial intermediary for convenient and secure transactions between online buyers and sellers. PayPal accepts payment in 24 currencies in 190 markets. This flexibility promotes cross-border trade, particularly among small businesses and international customers.[19]

- **Digital wallets.** Another form of Internet-based payment, these systems store users' financial data (including bank and credit card information) online—often in the cloud, where the data can be accessed using mobile devices. Digital wallets have typically been used in physical stores at point-of-sale (POS) stations, but also are increasingly being used for online payments.[20] Prominent U.S.-based digital wallet providers include Google Wallet, Levelup, PayPass/MasterPass (MasterCard), and V.me (Visa).[21]

[18] OECD, *The Economic and Social Role of Internet Intermediaries*, April 2010, 13.
[19] OECD, *The Economic and Social Role of Internet Intermediaries*, April 2010, 32; eBay, USITC hearing submission, March 25, 2013, 2–3.
[20] Cooper, "Digital Wallets Open Up," May 1, 2013.
[21] Barnes, "Assembling the Digital Payments Supply Chain," May 1, 2013.

Impact of Mobile Technology on E-commerce

Mobile broadband is having a major impact on the retailing sector, both in terms of sales and as a platform for targeted marketing efforts. Roughly a quarter of U.S. mobile Internet users made purchases via their phones. Retail sales made via mobile devices are growing rapidly.

- **Impact on spending.** Over 10 percent of U.S. consumers' e-commerce spending in 2012 was made using smartphones and tablets.[22] In 2011, such purchases accounted for 5–10 percent of retail e-commerce, equivalent to less than 1 percent of total retail purchases in the year.[23] However, the share of e-sales using such devices is predicted to increase to close to 25 percent by 2016, and mobile e-commerce is expected to grow rapidly in value over the next few years to reach an estimated $25 billion by 2017.[24] Expenditures on travel are expected to continue to be a significant share of such purchases, while e-commerce expenditures reportedly also will increase, including purchases of media programs (50 percent of spending), apparel, and consumer electronics.[25]

- **Impact on shopping patterns.** Consumers are increasingly using Internet-connected mobile devices as a shopping tool while browsing in stores to research products and compare prices. There are a number of mobile phone apps that can be used to scan barcodes to obtain comparative price and product information.[26] A recent survey indicated that 69 percent of mobile phone owners use their smartphones to access product information, and 82 percent of these use their devices in-store while shopping.[27]

- **Impact on customer check-out.** The main obstacle to greater customer use of mobile devices for shopping is reportedly the checkout experience—which can be difficult, given the relatively small screens of mobile devices.[28] Retailers, nevertheless, are embracing mobile technologies. Retailers are deploying mobile POS technology to allow sales associates to process and check out customer sales from any location in the store, which saves time for customers and enables associates to offer product recommendations and better customer service. Reportedly, nearly half of the leading U.S. retailers were either using mobile POS technology or were testing the technology.[29] For example, sales associates in Apple retail stores use Internet-connected tablets to access stock, shipping, and other information; process service requests; take hardware and software orders; and process customer payments. Other retailers, including grocery stores, are using wireless networked scanning devices as well as mobile phone apps that allow shoppers to scan and bag groceries while they shop, which saves time for customers and lowers checkout costs.[30]

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[22] Comscore, "State of the U.S. Online Retail Economy in Q4 2012," February 2013, 45.

[23] Estimates of shares of mobile e-commerce vary by source. For example, Comscore surveys indicate that the share is over 10 percent, while a McKinsey study estimates it at 5 percent. Comscore, "State of the U.S. Online Retail Economy in Q4 2012," February 2013, 45; McKinsey, *China's E-tail Revolution*, March 2013, 5.

[24] Huynh, "Mobile Commerce Is Positioned for Rapid Growth," August 15, 2012.

[25] Ibid.

[26] McKinsey Global Institute, *Big Data: The Next Frontier*, May 2011, 65.

[27] L2 Thinktank.com, "Digital IQ Index: Specialty Retail," September 6, 2012.

[28] Mulpuru, "US Mobile Retail Sales to Top $12 Billion," January 16, 2013.

[29] Deloitte, "Fourth Annual Ecommerce Assessment," February 2012, 11.

[30] Giant Foods, "Scan It!" n.d. (accessed March 27, 2013).

- **Impact on marketing.** The proliferation of smartphones in the retail setting is also allowing retailers to provide customized marketing offers directly to customers. The ability to send fewer, more targeted messages, often in real time, to core consumers is cited by industry sources as lowering marketing costs and increasing sales.[31]

U.S. and Global E-commerce

The United States led the world in retail e-commerce, capturing an estimated 32 percent of such sales in 2012.[32] More people shop online in the United States than in any other country.[33] The number of U.S. online shoppers was estimated at 172 million in 2010 and is forecast by industry observers to grow to 207 million in 2016.[34] U.S. per capita online spending, estimated at $1,207 in 2011, is expected to expand to $1,738 by 2016.[35] A large segment of such purchases are for travel, which accounted for 36 percent of purchases in 2012.[36] The average U.S. online shopper spends $631 per year online for travel.[37] Sources report that U.S. e-commerce transactions appear set to continue to grow rapidly during the next five years. Private sector projections estimate that U.S. online sales will grow to$370 billion by 2017, up from $231 billion in 2013.[38] E-sales growth likely will continue to outpace sales growth of brick-and-mortar stores, which have been flat or declining in recent years.[39]

Future of E-commerce

E-commerce will likely continue to grow in the near and long term. The widespread use of smartphones and tablets, which has enabled consumers to increase their time spent making purchases online, is an important driver to the strong growth in e-sales. Whereas most of the world's population currently does not have a PC, most are expected to have smartphones in the next three to five years, a development which will dramatically boost Internet connectivity and e-commerce.[40]

Merchants are improving their online and mobile interfaces with consumers. Online and traditional brick-and-mortar retailers are investing heavily in their Web divisions. More retailers offer hybrid online/offline services, such as in-store pickup for online purchases, or in-store returns for online purchases—all designed to make the overall shopping experience more convenient and facilitate seamless transitions between online and offline transactions, and further blurring the distinction between the online and the traditional economies.[41]

Online and brick-and-mortar retailers are also investing heavily in order-fulfillment infrastructure to reduce delivery times and improve customer service, which is likewise

[31] Deloitte, *Transforming Retail: How to Improve Performance,* 2012, 4.
[32] eMarketer.com, "In 2013, Asia-Pacific Will Lead the World in Online Sales." August 17, 2012.
[33] McKinsey Global Institute, *Internet Matters,* May 2011, 13.
[34] For consumers aged 14 years and older. EMarketer data as cited in Statista.com website (accessed March 22, 2013).
[35] Mashable.com, "Forrester: U.S. Online Retail Sales to Reach $327 Billion" (accessed February 12, 2013).
[36] Comscore, "State of Online Retail Economy," February 2013, 6.
[37] McKinsey Global Institute, *Internet Matters,* May 2011, 13.
[38] Techcrunch.com, "Forrester: U.S. Online Retail Sales to Rise," March 13, 2013.
[39] Ibid.
[40] eBay, *Towards Commerce 3.0,* October 2012, 10.
[41] Techcrunch.com, "Forrester: U.S. Online Retail Sales to Rise," March 13, 2013.

contributing to increased use of e-commerce.[42] Improved marketing efforts that specifically target core customers, along with loyalty programs such as Amazon Prime, make it easier for customers to make purchases with a single click, boosting e-sales. Moreover, customers are increasingly becoming comfortable purchasing large items, including appliances, online—items that consumers have traditionally wanted to see and touch in person.[43]

Leading E-commerce Sellers and Platforms

Amazon remains the world's leading online retailer. Amazon held a 20 percent U.S. market share in 2011, followed by eBay with a 16 percent share.[44] In value terms, at $48 billion, Amazon was by far the largest e-retailer (excluding firms that provide online platforms for other sellers, such as eBay and Etsy[45]); Amazon accounted for nearly half of the total sales of the 15 largest U.S. online retailers in 2011 (table 3.10). Other leading retailers were mass market vendors or certain types of specialty retailers, particularly computer and electronics merchants and office supply firms. Globally, behind Amazon (first place) and eBay (second place), China's Alibaba ranked third largest, and Japan's Rakuten ranked fourth largest among global online retailers.[46]

TABLE 3.10 Leading U.S. Internet retailers, ranked by online sales (2011)

Rank	Company	Category	Online sales (Billion $)
1	Amazon	Mass merchant	48.1
2	Staples	Office supplies	10.6
3	Apple	Computers/electronics	6.6
4	Walmart	Mass merchant	4.9
5	Dell	Computers/electronic	4.6
6	Office Depot	Office supplies	4.1
7	Liberty Interactive Corp.	Mass merchant	3.8
8	Sears	Mass merchant	3.6
9	Netflix	Books/music/videos	3.2
10	CDW Corp.	Computers/electronics	3.0
11	Best Buy	Computers/electronics	3.0
12	Office Max	Office supplies	2.9
13	Newegg	Computers/electronics	2.7
14	Macy's	Mass merchant	2.7
15	W.W. Grainger	Hardware/home improvement	2.2

Source: Internet retailer website, (accessed March 12, 2013).

As brick-and-mortar stores see flat or declining sales, many traditional retailers, such as department stores, are turning to e-commerce to boost sales. Among many large traditional retailers, e-sales have grown to represent one-quarter of their total sales.[47] Among the leading 15 online retailers cited by Internet Retailer, roughly half also have

[42] Morgan Stanley Research, "eCommerce Disruption: A Global Theme," January 6, 2013, 5.

[43] This has led to the phenomenon of "showrooming," in which customers visit stores to touch and feel products, but order online. Techcrunch.com website, "Forrester: U.S. Online Retail Sales to Rise," March 13, 2013.

[44] eCommerceWeekly.com, "eBay vs. Amazon: The Differences," July 19, 2012.

[45] E-retailers generally own the products that they sell online, earning sales margin on each product sold. eBay and Etsy, on the other hand, are digital platforms or marketplaces that match and facilitate transactions between sellers and buyers. These firms generate income through fees charged to sellers and/or buyers. Amazon is both an e-retailer and a platform for third-party transactions.

[46] comScore, June 2011, cited in Internet Retailer, "Amazon and eBay Lead in Global Traffic to E-commerce Sites," 2013.

[47] Leading traditional retailers selling products online include Macy's and Nordstrom. L2 Thinktank.com, Digital IQ Index: Specialty Retail. September 6, 2012.

significant brick-and-mortar businesses, including Staples, Apple, Walmart, Office Depot, and Sears.[48]

Uses of Data Analytics in E-commerce

Internet technologies are allowing retailers to track and analyze shopping patterns, demographic data, and customer transactions. Retailers are increasingly using analytics to better understand customer preferences and to develop and target personalized offerings.[49] Internet technologies are transforming marketing, both in-store and through social media and other Internet sites.

Data analytics allows retailers to focus on providing customers a "seamless, multichannel experience" in-store, on social media, on other websites, and via mobile devices.[50] According to one study, use of data analytics could increase operating margins by over 60 percent for certain retailers in sectors with tight profit margins. The study notes five key functional areas where data analytics could increase profitability: marketing, merchandising, operations, supply chain, and new business models.[51] Logistics providers also see the potential of using Internet technologies for tracking goods (box 3.2).

Financial Services

Since at least the 19th century, banking and other financial services in the United States were delivered to customers on a face-to-face basis, with customers visiting physical branches to make deposits and withdrawals, apply for loans, transfer funds, and solicit advice ranging from investments to trust services. Starting in the 1980s, banks began to incorporate electronic technology into the provision of banking services via the introduction of automated teller machines (ATMs) and telephone banking. ATMs enhance the speed and convenience of basic account management tasks like monitoring account balances, making withdrawals and deposits, and transferring money between checking and savings accounts. Telephone banking is even more convenient, allowing customers to not only perform account management tasks but also resolve problems and inquire about products and services from their homes.

[48] Internet Retailer, "Top 500 List," (accessed March 12, 2013).
[49] Deloitte, *Transforming Retail: How to Improve Performance,* 2012.
[50] Ibid., 8. Big Data analytics is described in more detail in chapter 2.
[51] For example, marketing, merchandising, operations, supply chain, and new business models. McKinsey Global Institute, *Big Data: The Next Frontier*, May 2011, 2; IBM Institute for Business Value, *Analytics: The Real-World Use of Big Data,* 2012, 64–73.

BOX 3.2 Express delivery services and Internet technologies

Logistics involves a range of related activities focused on the efficient movement of intermediate and finished products and services. It is therefore a key sector for the effective operation of commerce.[a] Leading U.S. suppliers of package and parcel (express) delivery services are UPS and FedEx; these two firms process over 60 percent of U.S. express delivery volumes. They also account for over two-thirds of home deliveries—42 percent and 25 percent, respectively.[b]

Internet technologies, including integrated logistics systems and networks, are crucial to allowing express delivery services to quickly and accurately move tens of millions of packages daily to most points across the globe.[c] Key logistics technologies include digitally integrated software and devices:

- Transportation management systems (TMS) are designed to optimize the flow of goods (by sea, air, and land) through manufacturing and retail supply chains.[d] TMS can be digitally connected to other logistics systems to handle orders, shipping instructions and other documentation, payments, and third-party logistics functions.[e]

- Electronic data interchange (EDI)—intercompany computer-to-computer transmissions of business information, often between different computer networks and programs—are key integrating technologies that link TMS and other computer systems among different businesses.

- Express delivery firms also use a variety of tracking and tracing technologies that are digitally connected to proprietary networks. Such technologies include delivery vehicle on-board computers and recorders, GPS systems, sensor and radio frequency tags and transmitters on trailers and in distribution centers, and a variety of handheld scanning devices, digital pens, smartphones, and tablets, all digitally linked to provide real-time information.

The proliferation of digitally integrated and connected tracing and tracking technology is creating a wealth of real-time data that can be analyzed to further increase logistical efficiency.[g] For example, UPS uses data analytics to lower maintenance costs on its fleet of 60,000 U.S.-based vehicles. The company has saved millions of dollars by using predictive analysis of data to determine when parts should be replaced, instead of replacing them on a fixed schedule. Such analytics have also allowed UPS to uncover defective parts early, which has avoided costly delays on deliveries.[h]

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[a] USITC, *Logistics Services*, 2005.
[b] IBISWorld, "Couriers and Local Delivery Services in the U.S.," March 2013, 3, 7.
[c] UPS alone processes 16 million packages daily. UPS "Worldwide Facts" (accessed March 30, 2013).
[d] Gonzalez, "An Overlooked (But Critical) Component," November 13, 2009.
[e] Gonzalez, "An Overlooked (But Critical) Component," November 13, 2009; Council of Supply Chain Management Professionals, "Supply Chain Management Terms and Glossary," February 2010, 192.
[f] FedEx, "Electronic Data Exchange" (accessed April 20, 2013).
[g] Swaminathan, "The Effects of Big Data," February 2012.
[h] Mayer-Schonberger and Cukier, *Big Data: A Revolution*, 2013, 59.

Financial Services in the Internet Era

Online banking services are now widely used in the U.S. market. Following the mainstream adoption of Internet access and usage in the late 1990s and early 2000s, retail financial services firms in the United States, including various bank-like institutions,[52] brokerage firms, and wealth and investment management firms, began to offer online access to financial services through dedicated company websites. Several Internet-only banks and brokerage firms, such as NetBank and E*Trade, also emerged during this period, although many such ventures ultimately filed for Chapter 7 bankruptcy or were later purchased by more established financial services companies.[53] In the early days,

[52] Bank-like institutions include credit unions, thrifts, and savings and loan companies, among others.
[53] *Economist*, "Retail Renaissance," May 19, 2012.

online banking services were only offered by large, well-funded firms, but by 2013 virtually all retail financial services providers in the United States offered such services.

Financial service firms of all types now offer a fairly standard set of online banking services. Online services typically include giving customers access to information about company products and services, access to their account information (account balances, transaction history, and statements), and the ability to conduct transactions. Typical banking transactions conducted online include paying bills and transferring funds, whereas brokerage firm and investment management transactions are mainly confined to purchasing and selling shares in individual investment instruments and/or mutual funds. Brokers and investment management firms also typically allow clients to access real-time financial market information, investment research, and financial planning tools and advice. In addition, many wealth management services provide one-stop-shop access to all of the banking, brokerage, and investment fund services detailed above.[54]

Mobile banking is increasingly popular. Starting with the launch of Apple's iPhone in 2007, a growing number of financial services providers began to offer customers the ability to access Internet banking services via mobile phones (mobile banking). By 2013, most large financial services providers and a rapidly growing number of smaller providers offered mobile banking apps that allow customers to access account information and conduct routine transactions on their smartphones and tablets.

The Internet plays a growing role in the information-gathering process for customers interested in buying insurance. Only a small share of customers, however, purchase retail insurance products—such as auto insurance, home insurance, renters' insurance, and life insurance—through online channels. One 2011 survey for example, found that 65 percent of respondents had visited at least one insurer website or quote aggregator website as part of the process of shopping for automobile insurance. Overall, about 3 million automobile insurance policies were sold online in 2011 in the United States, up 6 percent from 2010.[55] Another 2011 survey reported that over 60 percent of customers researched opening a bank account or purchasing life insurance products online, although they ultimately bought these products offline—in person at a branch or by phone or mail.[56]

Trends in the Adoption of Internet and Mobile Banking

U.S. customers increasingly prefer online banking. Due perhaps to the relative newness of Internet and mobile banking, data on the adoption of such services are scarce, pertain chiefly to the retail banking sector, and consist mainly of surveys conducted by government agencies, trade associations, and consulting firms. In a 2011 survey conducted by the American Bankers Association, for example, 62 percent of respondents listed online banking as their preferred method of banking, up from 55 percent in 2010. Not surprisingly, as Internet banking grew, preferences for other types of banking declined. The number of respondents preferring mobile banking, for example, was only 1 percent in 2011, down from 3 percent in 2010; among the 18–34 age group, mobile banking adoption was not much more widespread, with only 4 percent of respondents stating a preference for mobile apps. Preference for other forms of banking were also in decline, with only 20 percent preferring branch banking, 8 percent preferring ATM

[54] For examples, see the websites of the Bank of America, http://www.bankofamerica.com (accessed April 1, 2013); The Vanguard Group, http://www.vanguard.com (accessed April 1, 2013); TD Ameritrade, http://www.tdameritrade.com (accessed April 1, 2013); and JP Morgan Private Bank, http://www.jpmorgan.com/pages/jpmorgan/private_banking (accessed April 1, 2013).

[55] Insurance Information Institute, *The Financial Services Fact Book 2013*, 2013, 193.

[56] Strothkamp, "2012 State of Digital Financial Services," June 21, 2012, 15.

banking, 6 percent preferring banking by mail, and 3 percent preferring telephone banking, down from 25 percent, 15 percent, 8 percent, and 6 percent in 2010, respectively.[57]

Online banking is more popular than telephone banking among U.S. Internet users. A December 2011–January 2012 survey found that 68 percent of U.S. Internet users with bank accounts reported using online banking in the previous 12 months, compared with 33 percent reporting to have used telephone banking services, and only 21 percent reporting to have used a mobile banking app. According to this survey, the usage of mobile banking apps to conduct transactions is hindered by security concerns (reported by 48 percent of respondents) and lack of need (58 percent).[58]

The adoption of Internet banking is growing around the world, but varies dramatically from country to country. In Europe, for example, the percentage of the population that has adopted online banking ranges from 77 percent in the Netherlands to 3 percent in Romania, with an average of about 40 percent.[59] Similarly, a survey conducted by PricewaterhouseCoopers in nine countries[60] revealed that the percentage of respondents who used the Internet to purchase financial products ranged around 70 percent, with the United Arab Emirates reporting the highest such usage (about 75 percent) and France the lowest (about 55 percent). The variation between countries related to the use of mobile phones to purchase financial products was even greater, with approximately 55 percent of respondents in India reporting mobile phone purchases, compared to only 15 percent in France.[61]

Professional Services

Professional services—covering a wide range of sectors, including legal, architectural and engineering, and management consulting services—are increasingly becoming digitally intensive and enabled. Internet technologies are transforming the way professional services are produced, greatly increasing productivity, lowering costs, and broadening the scope and speed of delivery. Professional service products, such as legal briefs, consulting reports, or architectural and engineering designs, can easily be digitized and transmitted over the Internet and account for an ever-greater share of international trade.[62] Whereas professional services traditionally have been provided in person, Internet technologies are eliminating geographic limitations, so that many professional services can be produced and transmitted from any Internet connected location on the globe.

[57] Stewart, "Online Banking Surges, Mobile Lags," September 8, 2011.

[58] Board of Governors of the Federal Reserve, *Consumers and Mobile Financial Services*, March 2012.

[59] Research conducted by Deutsche Bank Research, Eurostat, Forrester Research, and Pew, cited in TheCityUK, *Key Facts about EU Financial and Professional Services*, January 2013, 2.

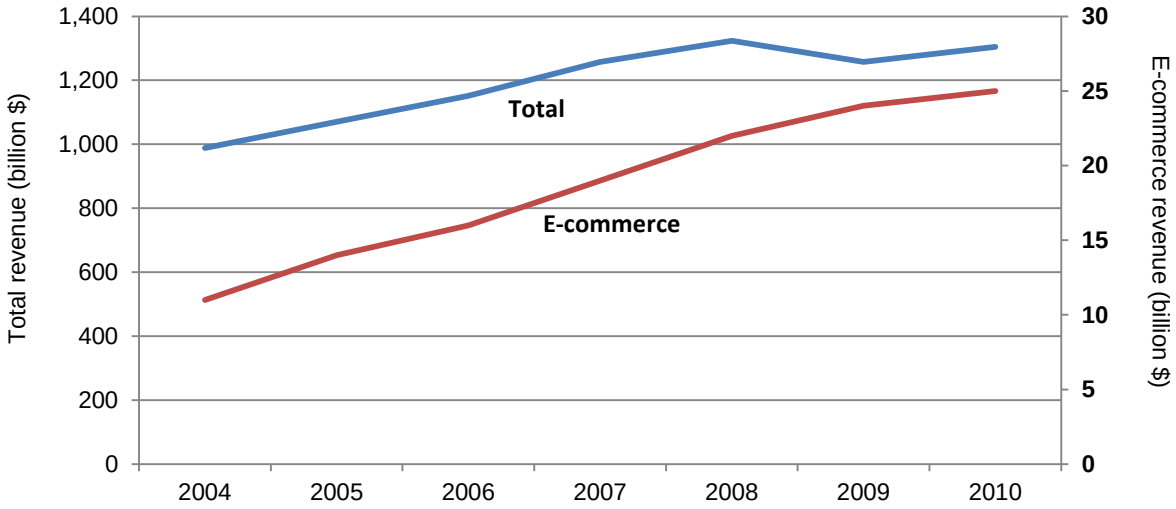
[60] Reporting countries included Canada, China, France, Hong Kong, India, Mexico, Poland, the United Arab Emirates, and the United Kingdom.

[61] PwC, *The New Digital Tipping Point*, 2011, 6.

[62] The Internet facilitates cross-border exports of professional services—for example, when a service product such as an engineering plan or a legal brief is delivered electronically to a consumer in another country via the Internet. Internet technologies also facilitate trade through commercial presence, when a services provider such as a U.S. law or accounting firm establishes an affiliated company abroad to serve local clients. Although final delivery of the product is provided by the local affiliate, the corresponding work product may well be produced in a firm's offices elsewhere in the world. Other channels of professional services trade also are enabled by Internet technologies: for example, if managers or technical personnel employed at a company's headquarters in the home market are sent to do short-term work in one of the firm's overseas affiliates, they may use digital links to correspond and transmit work products between the affiliate and home office. See chapter 4 for data and discussion of trade in digital products and services.

U.S. professional services[63] revenue totaled $1.3 trillion in 2010, and about $25 billion, or 2 percent, of such revenue was generated through e-commerce (latest available data).[64] Since 2004, professional services e-commerce revenue has more than doubled (figure 3.2). E-commerce revenue increased even during the 2008–09 recession, when total professional services revenues declined. Moreover, the e-commerce component of professional services revenue increased at a 15 percent compound annual growth rate during 2004–10 (albeit from a small base), compared to a 5 percent annual growth rate for total professional services revenue during the period.

FIGURE 3.2 U.S. professional services revenue: Total and e-commerce, 2004–10



Source: U.S. Census Bureau, *2011 Annual Services Report*.

The following discussion focuses on the legal and architectural and engineering services industries, where the adoption of Internet technologies has been transformative.

Legal Services

Law firms are increasingly turning to Internet technologies to boost productivity, improve customer service, and lower costs. Facing increased competition from the technology-driven commoditization of legal services and the rise of nontraditional providers,[65] law firms are upgrading their computer networks to optimize information storage and to improve their legal research capabilities, as discussed in more detail below.[66] Such technologies include e-discovery software, online legal libraries and search engines, generic legal documents, and networks that enable legal services outsourcing. Internet technologies also are facilitating the internationalization of law firms as the technologies allow fast, secure, and reliable transmission.[67]

[63] NAICS code 54. The sector also includes technical and scientific services. See USDOC, Census Bureau, "Industry Summary," for a description of these services.

[64] NAICS code 54, excluding NAICS 54112 (offices of notaries). USDOC, Census Bureau, E-Stats, May 2012.

[65] Georgetown Law, *2013 Report on the State of the Legal Market*, 2013, 12–13.

[66] IBISWorld, "Law Firms in the US," March, 2013, 29, 31.

[67] Ibid.

E-discovery software is increasingly replacing the costly, labor-intensive, and time-consuming function of discovery (the process of reviewing and providing information in a legal case). Such programs use "predictive coding," which are sophisticated algorithms that determine the relevance of information for a case.[68] Sales of such software reached $1.4 billion in 2012 and are forecast to increase to nearly $3 billion by 2017.[69] Another Internet-related innovation has been the growth of online legal libraries that have hotlink functionality (the automatic linking and updating of legal documents) and search functionality, tools that are providing smaller firms with increased capabilities at relatively low cost.[70] Such technologies are contributing to a leveling of the playing field between large and small law firms.[71]

The Internet is fueling competition for legal services. Consumers no longer need to visit the office of an attorney to acquire legal assistance. Websites like LegalZoom, Rocket Lawyer, and many others provide personalized legal documents online, including wills, powers of attorney, incorporation documents, real estate deeds, trusts, legal compliance documents, and so forth.[72] In order to compete with these online-only service providers, many traditional law firms are offering similar fee-based services online. In addition, other related services are now available online, such as websites that match clients with lawyers (for example, Legalmatch) by allowing clients to present a case online at no charge and have licensed attorneys review and compete for their business. The client decides whether to accept attorney proposals; the website provides background information, fee schedules, and ratings on each attorney for its users.[73]

Internet technologies also are facilitating the outsourcing of a greater variety of legal functions, including document drafting and litigation support. Whereas outsourcing was once focused on taking advantage of low-wage labor, according to one observer there has been a shift towards outsourcing for technological capability.[74] For example, a large India-based legal process outsourcing firm is now providing clients in many countries with regulatory compliance services using specialized software to find gaps between a firm's existing policies and new regulations. The firm is also using proprietary digital technology to assist its clients with patent management services, a logical consequence of the proliferation of intellectual property assets globally in recent years.[75]

Architectural and Engineering Services

One of the most important technological advancements in architectural and engineering services has been the development of computer-aided design (CAD) technology, which

[68] Palazzolo, "Why Hire a Lawyer? Computers Are Cheaper," June 18, 2012.
[69] Law Technology News, "Gartner Forecasts E-Discovery Growth," January 3, 2013.
[70] IBISWorld, "Law Firms in the US," March, 2013, 31.
[71] Georgetown Law, *2013 Report on the State of the Legal Market*, 2013, 13.
[72] See LegalZoom.com, http://www.legalzoom.com/; Rocketlawyer.com, http://www.rocketlawyer.com/.
[73] Legalmatch.com website, http://www.legalmatch.com/.
[74] Brennan, "Straight from the Outsource," January 1, 2013.
[75] Ibid.

has dramatically increased project efficiency.[76] CAD allows for efficient development and electronic storage of plans and is very useful for document control and file sharing. Everyone on a design team can access plans by using a digital checkout. The digitization of plans also facilitates transmission of plans via the Internet among associated firms and suppliers, clients, and inspection authorities.[77]

Another critical Internet technology used by architectural and engineering firms is file-sharing software such as SharePoint. Such document management programs allow users to upload very high-megabyte engineering plans for access by engineers, architects, project managers, and others on the network. CAD capability when combined with digital storage technology allows architectural engineering plans to be worked on anywhere in the world. As a result, U.S.-based engineering firms now typically maintain offices called high-value engineering centers (HVECs) in countries like India or China, where architectural and engineering labor costs are lower.[78]

The combination of CADs and file-sharing technology allows the cycling of design plans, which can be worked on around the globe virtually 24 hours per day. For example, engineers in Houston may review and comment on engineering plans prepared by a HVEC office in Shanghai. At the end of the day, the plans are placed in a shared file location on the company's proprietary network and are worked on by colleagues in China while the U.S.-based engineer is asleep. In the morning, the plans are ready to be worked on again in the Houston office.[79] Such technologies have dramatically increased project efficiency by minimizing design time and lowering costs, with HVECs producing much of the granular design work.[80]

Internet Technologies and Healthcare

Internet technologies are changing the way healthcare is delivered and, as a result, are transforming the patient-provider-insurer relationship. The use of Internet technologies to store, share, and analyze health data enables more efficient management of information and fosters increased communication between all parties involved.[81] A major benefit is that two important sources of inefficiency are addressed: delivery fragmentation and poor transfer of information (for example, when an elderly patient with various chronic conditions sees multiple providers who maintain separate health records on the same patient).[82] Internet technologies are increasingly being used in a variety of healthcare applications, such as telemedicine, electronic health records (EHR) management, Internet-based diagnostic services, health information portals, cloud computing applications for record storage, data processing and sharing, e-referrals and e-

[76] CAD software enables users to create sophisticated and detailed technical designs and models that can be easily modified and analyzed and that include data on materials and processes. For example, chemical engineers use CAD to create two- and three-dimensional design plans of petrochemical plant processes that graphically depict the routing of complicated networks of pipes, including all dimensions, heights, diameters, and turns, as well as the three-dimensional location of equipment (such as pumps, drums, compressors, and distillation tanks). CAD programs also can be used to calculate the overall weight and balance points of an engineering structure, which is particularly critical in offshore platform design. IBISWorld, "Global Engineering Services," February 2013, 34; industry representative, telephone interview by Commission staff, April 22, 2013.

[77] Industry representative, telephone interview by Commission staff, April 22, 2013.

[78] For a description of an HVEC used by one prominent U.S. engineering company, see Worley Parsons, "Workshare," (accessed May 15, 2013)

[79] Industry representative, telephone interview by USITC staff, April 22, 2013.

[80] Ibid.

[81] Accenture, *Making the Case for Connected Health*, 2012, 3.

[82] OECD, "Improving Health Sector Efficiency," OECD Health Policy Studies, 2010, 12.

prescriptions, and medical transcription. All of these are transforming the provision of healthcare in the United States and elsewhere.

Telemedicine

Telemedicine,[83] the use of Internet technologies to deliver healthcare over distance, is a promising new development, particularly as it enables the cost-effective delivery of health services to traditionally underserved patients and communities.[84] Telemedicine can overcome geographic barriers through remote monitoring, diagnosis, or treatment, and lowers costs by providing care outside of expensive hospital settings.[85] A wide range of new Internet technologies are facilitating remote communication and diagnosis. Handheld and touchscreen devices can upload patient information to digital networks, and other smart devices, such as "intelligent shirts," can track heart rate, temperature, and other health data.[86] Teleradiology, the remote viewing or diagnosis of images obtained in another location, is the leading application of telemedicine worldwide.[87] Other commonly provided remote services include dermatology, pathology, and cardiology.[88]

Telemedicine also promotes collaboration among healthcare professionals through remote training and sharing of information, often through international partnerships, and it enables providers in all countries to consult on patients they may not see in person.[89] Telemedicine can facilitate trade when service providers directly treat patients across borders or outsource certain functions, such as radiology readings.[90]

Electronic Health Records (EHRs) and Other Health Data

EHR systems apply a variety of Internet technologies to lower costs and improve patient outcomes. These digital files contain a patient's complete medical record and history, including documentation of illnesses, treatments, laboratory results, prescriptions, and allergies.[91] EHRs allow the sharing of digitized patient information across various healthcare settings, which strengthens continuity of treatment and collaboration among different providers.[92] One study estimated that EHRs could save the U.S. healthcare system $1 billion annually, just by reducing the number of adverse drug events.[93] Cost savings are also realized as EHRs and other digital products—including electronic referrals and electronic prescription software—streamline communications and reduce administrative costs.[94]

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[83] The World Health Organization (WHO) defines telemedicine as "the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities." Accenture, *Making the Case for Connected Health*, 2012, 15.

[84] WHO, *Telemedicine*, 2010, 9.

[85] Accenture, *Making the Case for Connected Health*, 2012.

[86] Ibid., 15.

[87] Thrall, "Teleradiology Part I," June 2007, 613.

[88] In a WHO survey, 60 percent of responding countries offered some form of teleradiology, and more than 30 percent had an established service. WHO, *Telemedicine*, 2010, 9, 37, 43.

[89] WHO, *Telemedicine*, 2010, 15.

[90] Castro, "Explaining International IT Application Leadership," September 2009, 22, 23.

[91] Castro and Atkinson, "Ten Ideas for Policymakers," March/April 2009, 71.

[92] Accenture, *Making the Case for Connected Health*, 2012, 6; Castro and Atkinson, *Ten Ideas for Policymakers*, March/April 2009, 71.

[93] Castro and Atkinson, "Ten Ideas for Policymakers," March/April 2009, 71.

[94] Chikotie, Oni, and Owei, "Factors Determining the Adoption of ICTs," 2011; HealthIT.gov, "Basics of Health IT" (accessed June 6, 2013).

The U.S. healthcare industry generates enormous volumes of data, including EHRs, clinical and laboratory information, drug interaction statistics, and other diagnostic data (e.g., MRIs and CT scans, images, and film). One study reports that analyzing these datasets and applying the knowledge that can be derived from them could lead to efficiency and quality gains within the system and result in savings of $300 billion within 10 years.[95]

The U.S. government funds a variety of health data projects related to improved EHRs. The 2009 Health Information Technology for Economic and Clinical Health Act provides the U.S. healthcare system with financial incentives to use EHRs and other digital health data initiatives.[96] The U.S. Centers for Medicare and Medicaid Services reported government expenditures of $6.6 billion on EHR systems incentives, and funding for such health IT is expected to grow.[97] Examples of U.S. government-funded Big Data analytics projects cover the spectrum of health issues, including the human genome, infectious diseases, datasets on aging, and cancer imaging.[98]

Internet Technologies and Health Insurance Providers

Internet technologies are also increasingly being used by health insurers to improve efficiency, reduce waste and costs, and improve patient health outcomes. For example, Horizon Healthcare Innovations, a subsidiary of Horizon Blue Cross Blue Shield of New Jersey, is using the Internet to lower costs and improve care by creating "dashboards" (webpages that interface with users and that update and collate information). Dashboards allow providers to record and remotely monitor wellness and risk factors of chronically ill patients. Under this system, patients use Bluetooth-enabled weight-, pulse-, and oxygen-measuring devices that automatically transmit data to the dashboards.[99] Health insurance providers are also providing online health monitoring services. For example, the Blue Cross Blue Shield Federal Employee Program provides an online weight management program that allows users to assess current weight and health, develop a weight reduction program, and track progress towards program goals.[100] The insurer also provides online access to advice lines staffed by nurses and audio "health files" on chronic and common diseases.[101] Insurance companies are also benefiting from EHRs, discussed above, which are linked to faster and more efficient processing of insurance claims.[102]

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[95] According to McKinsey Global Institute, an example of Big Data analytics that has saved patients' lives is Kaiser Permanente's analysis of its large clinical and cost databases. That analysis resulted in the uncovering of the very harmful effects on cardiovascular health of the popular arthritis drug Vioxx, leading to the largest drug recall in U.S. history (sales of the drug at that time were reported to be over $2 billion annually). McKinsey Global Institute, *Big Data: The Next Frontier*, May 2011, 39, 41.

[96] Jamoom et al., *Physician Adoption of Electronic Health Record Systems*, July 2012.

[97] As of July 2012. Castro, "Health IT in 2013: A Renewed Focus," February 5, 2013.

[98] Executive Office of the President, "Big Data across the Federal Government," March 29, 2012.

[99] Oxford Economics, *The New Digital Economy*, June 2011.

[100] Blue Cross Blue Shield Federal Employee Program, "Fit With Blue," http://www.fepblue.org/healthwellness/wellness-programs/fit-with-blue.jsp (accessed March 12, 2013).

[101] Blue Cross Blue Shield Federal Employee Program, "Research and Advice," http://www.fepblue.org/healthwellness/research-advice.jsp (accessed March 12, 2013).

[102] HealthIT.gov, "Benefits of EHRs: Medical Practice Efficiencies and Cost Savings" (accessed May 5, 2013).

Other Uses of Internet Technologies in Healthcare and Education

Cloud-based technologies for data processing, storage, and sharing are also being used by many healthcare organizations.[103] Such technologies assist communication and collaboration among various organizational units and staff of healthcare establishments. For example, a human development organization with offices and personnel worldwide is using cloud technology to link professional staff working in health, nutrition, economic development, and other areas under a single unified system for all offices.[104]

Internet technologies are also being used to more efficiently distribute drugs in rural areas of developing countries that lack sophisticated healthcare infrastructure. One application includes a pharmaceutical stock management system in Africa. IBM, Novartis, and Vodaphone created a digital solution that combines mobile phones, short messaging service (SMS) technologies, and websites to track and manage the supply of malaria drugs in remote areas of Tanzania. The program ensures quick access to these life-saving drugs and allows efficient and timely distribution and stocking of drugs at local clinics, which is lowering disease and mortality rates.[105]

Finally, Internet technologies are allowing patients to become more active in their healthcare decisions. The proliferation of health information websites such as NIH.gov, WebMD.com,[106] and MayoClinic.com, where consumers can research health topics, including illness and disease, that influence their healthcare choices, is facilitating "healthcare consumerism."[107] Aside from these free sites, there are numerous fee-based online health services where patients can access doctors and nurses for medical advice in real time. As individuals increasingly research questions about their healthcare needs using Internet search engines and social media, they generate data about people's most pressing healthcare concerns. A novel application of such user-generated information is the analysis of health-seeking behavior of Internet users. For example, researchers have used information on Google search queries related to "flu" to track influenza illness. One study found high correlations of such searches with the level of flu activity, and used this data to accurately predict the incidence of disease by geographic region in the United States. This type of analysis may be used to predict and control future epidemics.[108]

In a parallel development, the education sector is starting to use Internet technologies in innovative ways. These new approaches allow students to choose their educational providers (box 3.3).

[103] Cloud computing is more fully described in chapter 2.
[104] Microsoft, "Health Organizations Prescribe a Move to the Cloud," March 4, 2013.
[105] Industry representative, interview by USITC staff, Washington, DC, February 11, 2013; IBM "Saving Lives with SMS for Life," December 14, 2009.
[106] Health websites www.WebMD.com and www.everydayhealth.com were among the top 50 Internet websites by revenue. Comscore, "ComScore Media Metrix Ranks Top 50," February 27, 2013.
[107] Deloitte, "Consumerism in Health Care," June 12, 2012.
[108] Ginsberg et al., "Detecting Influenza Epidemics," February 19, 2009, 1012–14.

BOX 3.3 Education over the Internet: Massive open online courses

Massive open online courses (MOOCs) are free, university-level courses offered by specialized MOOC websites. Although these websites have been around since at least 2010, offered by organizations like Academic Earth and Open Culture, MOOCs received a surge of attention with the launch of several high-profile websites in 2012, namely Coursera, edX, and Udacity.

Since their launch, student interest in classes offered by MOOC websites has been substantial, particularly outside the United States. The increase in interest is largely because these websites feature top-level academic instruction from some of the world's leading universities, including Harvard University, the Massachusetts Institute of Technology, and Stanford University.[a] In the fall of 2012, for example, eight public health classes offered by Johns Hopkins University on Coursera enrolled more than 170,000 students.[b]

Although students can currently register for and view MOOCs free of charge, the universities contributing class content typically offer only a few classes and do not allow students to earn grades, credit, or academic degrees.[c] Despite class enrollments that can range from a few hundred students to tens of thousands, participation and completion rates are often substantially lower. Coursera, for example, estimates that only 40–60 percent of registered students attempt the first assignment, while only 10–15 percent will complete an entire course.[d]

Despite the initial interest, many universities, including those that offer classroom content, are reportedly wary of the MOOC phenomenon. Such caution largely stems from concerns that the large-scale delivery of education instruction will erode academic and social reputations based upon decades of selectivity and scarcity. Many universities, too, are concerned that their lucrative, campus-based business model could be undercut by the low-cost delivery of education content over the Internet.[e] Some observers are also concerned about the academic integrity of MOOC-based education, with issues like academic rigor, identity verification, and test security foremost among such concerns. In response, some MOOCs are attempting to mimic the classroom experience by establishing quizzes, online discussion forums, instructor email access, and final exams.[f]

MOOC websites, particularly Coursera and Udacity, which are backed by venture capital funding, are also beginning to explore ways to earn revenues, including charging licensing fees for classes, selling branded certificates of completion, and collecting fees for referring high-performing students to employers. Affiliate revenues may also be a possibility. Coursera, for example, is an Amazon affiliate, receiving a small commission for students that click through to the Amazon website to buy recommended textbooks and other products.[g]

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[a] Starting in late 2012 and early 2013, many MOOC websites began to offer online classes from a broader array of universities.

[b] Anderson, "Elite Education for the Masses," November 5, 2012.

[c] Coursera website, http://www.coursera.org (accessed December 19, 2012); edX website, http://www.edx.org (accessed December 19, 2012); Udacity website, http://www.udacity.org (accessed December 19, 2012).

[d] Anderson, "Elite Education for the Masses," November 5, 2012.

[e] Ibid.

[f] Ibid.

[g] Korn and Levitz, "Online Courses Look for a Business Model," January 1, 2013; Lewin, "Students Rush to Web Classes," January 6, 2013.

Note: For additional information on developments in the educational sector, see U.S. International Trade Commission (USITC). *Recent Trends in U.S. Services, 2013 Annual Report*, USITC Publication 4412. Washington, DC: USITC, 2013.

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CHAPTER 4
International Trade and Investment in Digital Trade-related Industries

U.S. digital trade-related exports are increasing. Exports totaled $356.1 billion in 2011, up from $282.1 billion in 2007.[1] Foreign direct investment (FDI) patterns and the expansion of U.S. companies' operations abroad mirrored this trend. Sales by majority-owned foreign affiliates of U.S. companies in the information sector totaled $134.1 billion in 2010, up from $92.5 billion in 2006.[2]

This chapter presents information on international trade and investment in digital trade-related industries. It begins with an overview of data sources and data availability. Next, it uses publicly available business and economic data to examine what is known about U.S. and international cross-border services trade, which is assumed to include a high degree of digital trade. Finally, it provides comparisons of international services data across countries, including an examination of services data from the Organisation for Economic Co-operation and Development (OECD) and of measures of e-commerce provided by other sources.

Data Sources Overview

Comprehensive statistics for international digital trade are unavailable because digital products are not separately classified by type, as physical goods are. When digital goods are traded, no tangible item crosses a country border or moves through customs authorities for counting or valuation. Moreover, as discussed in chapter 1, there is no standard or generally accepted definition for digital trade. For purposes of this report, digital trade is defined as commerce in products and services delivered via the Internet.

Nevertheless, anecdotal evidence suggests that international trade in digital products and services is growing rapidly. For example, digital music owned by parties in one country is downloaded by consumers in other countries, a trend that is increasing in size and value; insurance for international freight is sold online; and domestic architecture firms export their designs over the Internet to clients overseas. Yet data on such transactions are scarce, and the need for better information is a common refrain among industry and researchers.[3]

[1] USDOC, BEA, U.S. International Services database (accessed June 5, 2013). These are the most recently available data, and are based on BEA data on exports in services industries termed "digitally enabled" by BEA. These industries include business, professional, and technical services, including information services; royalties and license fees; and financial and insurance services. USDOC, BEA, Cross-Border Trade in Services, 2012. See footnote 7 for a more detailed definition of digitally enabled services used in analyzing these data.

[2] Ibid. The information sector is discussed further in the Foreign Investment and Digital Trade section of this chapter.

[3] Etsy, post-hearing brief to the USITC, March 14, 2013, 1; USITC, hearing transcript, March 7, 2013, 17 (testimony of Ed Gresser, Global Works Foundation, Progressive Economy); Mandel, "Data, Trade, and Growth," March 1, 2013, 3; Stewart, prehearing brief to the USITC, March 7, 2013, 1.

Official statistics on services trade offer only partial coverage of U.S. digital trade. These data, collected by the U.S. Department of Commerce (USDOC) Bureau of Economic Analysis (BEA) through surveys, capture both conventional cross-border services trade and transactions effected by affiliates in host markets. Such data capture certain services that are associated with digital trade, but also include many traditional nondigital services. Moreover, foreign direct investment (FDI) statistics from the BEA and project data compiled by commercial databases[4] also highlight the foreign operations of companies active in industries assumed to be digital trade-related. E-commerce trade flows (the amount of physical goods sold through Internet-facilitated transactions) have also been identified for some industries through U.S. Census Bureau (Census) surveys, and more broadly by an eBay transactions study.[5] Table 4.1 lists sources of available digital trade-related data.

TABLE 4.1 Digital trade: Available data sources

Organization	Data series	Description
BEA	U.S. International Services—cross-border trade in services	U.S. exports and imports of services in the conventional sense, based on Balance of Payments Manual, Fifth Edition (BPM5) categorization.
	U.S. International Services—services supplied through affiliates	Services supplied abroad (exports) or to the United States (imports) by an affiliate of a U.S.- or foreign-headquartered multinational company. Categorized by North American Industry Classification System (NAICS) codes.
	U.S. Direct Investment Abroad and Foreign Direct Investment in the United States	Statistics on U.S. outward investment in firms that are at least 10-percent foreign-owned. Categorized by NAICS codes.
Census	E-Stats	Transactions completed online. Categorized by NAICS codes, these data combine domestic and international e-commerce receipts.
OECD	Statistics on International Trade in Services	OECD member exports and imports of services (plus Hong Kong and Russia), based on BPM5 categorization.
Eurostat	Foreign Affiliates of EU Enterprises	Services supplied abroad (export) or to the European Union (import) by an affiliate of an EU- or foreign-headquartered multinational company. Categorized by NACE[a] 1.1 and NACE[a] 2 codes.
Bureau Van Dijk	Zephyr M&A database	Company merger and acquisition information.
Financial Times	fDi Markets greenfield FDI project database[b]	Company greenfield FDI information.

Source: Compiled by USITC.

[a]Statistical classification of economic activities in the European Community. The acronym comes from the French "nomenclature statistique des activités économiques dans la Communauté Européenne."

[b]"Greenfield" investments are investments in new enterprises, as opposed to existing ones ("brownfield" investments).Statistical classification of economic activities in the European Community.

Another approach to estimating the level of international digital trade is to measure actual cross-border data flows (as measured in megabytes), rather than the value of digital products and services. This approach has not been adopted in this report. However, a data flow proxy and its implications are discussed later in this chapter.

[4] Databases used in this report include the Financial Times' fDi Markets greenfield investment database and Bureau Van Dijk's Zephyr mergers and acquisitions (M&A) database.

[5] eBay, "Enabling Traders to Enter and Grow," March 2012.

U.S. Cross-Border Services Statistics and International Digital Trade

An important baseline for this analysis is provided in a 2012 BEA staff working paper, which estimated that U.S. cross-border trade in "digitally enabled" services in 2010 totaled $324.0 billion in exports and $207.6 billion in imports.[6] In that study, the authors defined digitally enabled services as "those for which digital information and communications technologies (ICT) play an important role in facilitating cross-border trade in services." [7] The BEA definition of digitally enabled services was based loosely on a report released by the United Nations Committee on Trade and Development (UNCTAD), which estimated that half the world's services trade was ICT enabled at that time.[8] Since BEA does not measure the amount of trade in these industries that actually occurs over digital networks, and the proportion is not available elsewhere, the authors assumed that all trade in such industries was digital, as does this chapter. Using the same categories as the BEA authors, the Commission extended the table to include 2011 (figure 4.1).

U.S. exports of these digital services have exceeded imports in every year from 2007 through 2011, which is consistent with the pattern for overall cross-border services trade. Digital exports and imports both grew over the period, with exports increasing 26 percent to $356.1 billion and imports increasing 30 percent to $221.3 billion. Digital services exports and imports also both grew faster than overall services trade during this period.[9] This is consistent with other studies that have used services data as a digital trade proxy. For instance, Gresser identified "Internet-suited" services and found there were steady increases in exports and imports in these categories over the past 20 years. Additionally, he noted that this was consistent with the increase in Internet users and Internet infrastructure improvements, such as transatlantic fiber-optic cable installation, over the same period, thereby supporting the use of these services statistics to proxy international digital trade.[10]

[6] These numbers do not reflect subsequent BEA revisions. Borga and Koncz-Bruner, "Trends in Digitally-Enabled Trade in Services," 2012, 1.

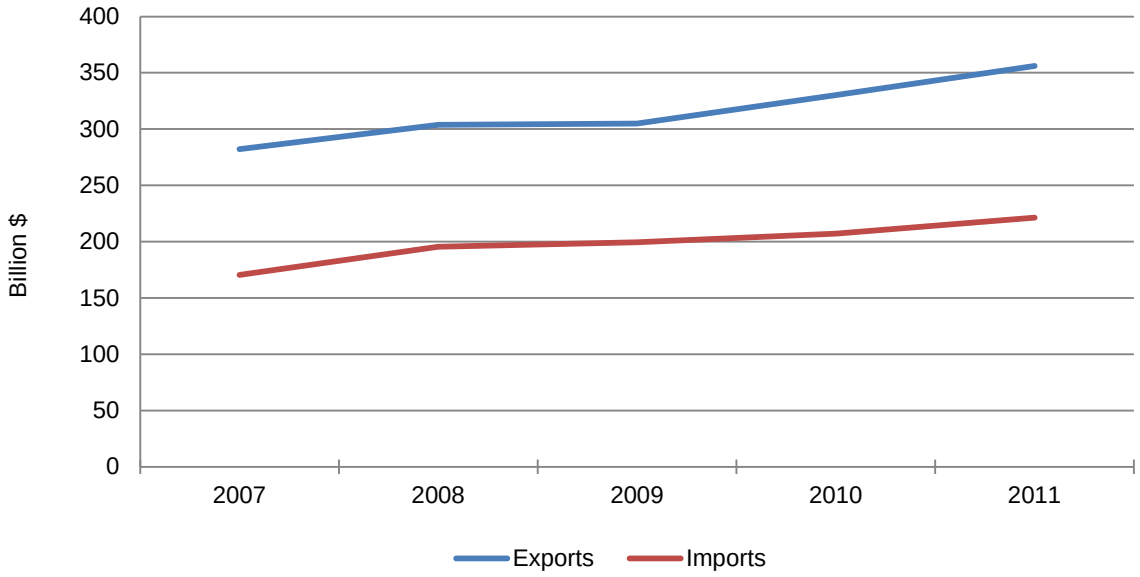
[7] The BEA definition of digitally enabled services is different from the one used by the Commission in chapter 3 of this report. The BEA's digitally enabled services categories included royalties and license fees; financial and insurance services; telecommunications; and business, professional, and technical services. The education and construction subcategories were not included. Subcategories included under royalties and license fees are industrial process; film and television tape distribution; and other royalties and license fees. Business, professional, and technical services comprise computer and information services (broken into computer and data processing services and database and other information services); management and consulting services; research and development and testing services; operational leasing; accounting, auditing, and bookkeeping services; advertising; architectural, engineering, and other technical services; industrial engineering; installation, maintenance, and repair of equipment; training services; and other. Ibid., 1; BEA, U.S. International Services database (accessed April 17, 2013).

[8] Borga and Koncz-Bruner, "Trends in Digitally-Enabled Trade in Services," BEA, 2012, 1; Lee-Makiyama, post-hearing brief to the USITC, March 27, 2013; UNCTAD, "Information Economy Report 2009," 2009.

[9] Annual growth rates for services exports and imports were 4.8 percent and 3.3 percent respectively from 2007 through 2011, whereas digital exports and imports grew at 5.1 percent and 6.7 percent annual rates respectively.

[10] Gresser, *Lines of Light*, May 8, 2012, 6.

FIGURE 4.1 BEA-defined digitally enabled international U.S. services trade

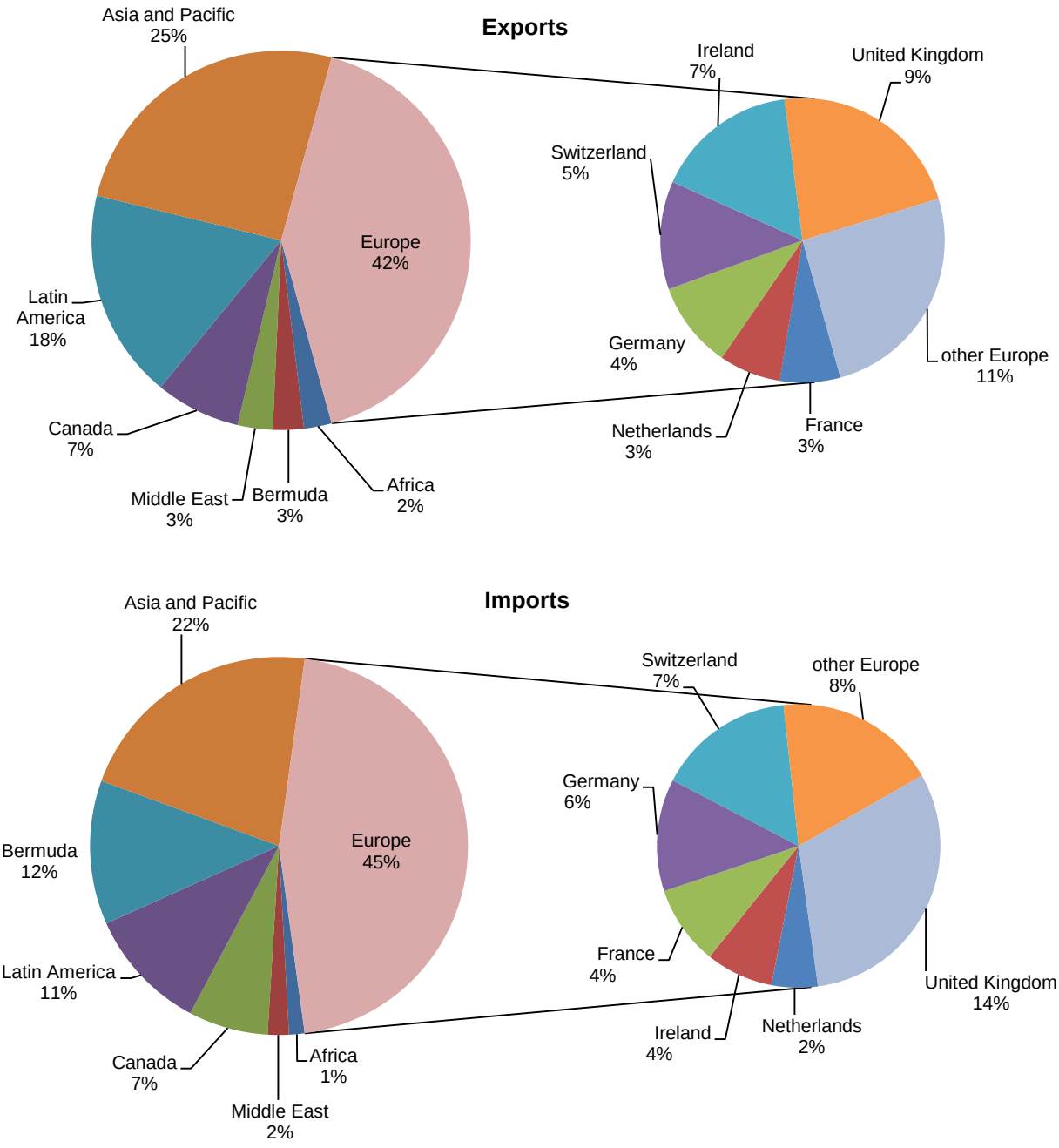


Source: USDOC, BEA, revised services statistics, 2012 .

Looking more closely into services trade data reveals that the most important regional trading partner for the United States is Europe, with U.S. exports going principally to the United Kingdom, Canada, and Ireland, and U.S. imports coming principally from the United Kingdom, Bermuda,[11] and Switzerland (see figure 4.2). This is, in part, a reflection of these trading partners' strong Internet infrastructures and specialization in highly digitally enabled industries, such as financial services. A more detailed breakdown of the largest U.S. digital services export and import categories is shown in figure 4.3. The categories are business, professional, and technical services (which includes the subcategory computer and information services); royalties and license fees; and financial and insurance services.

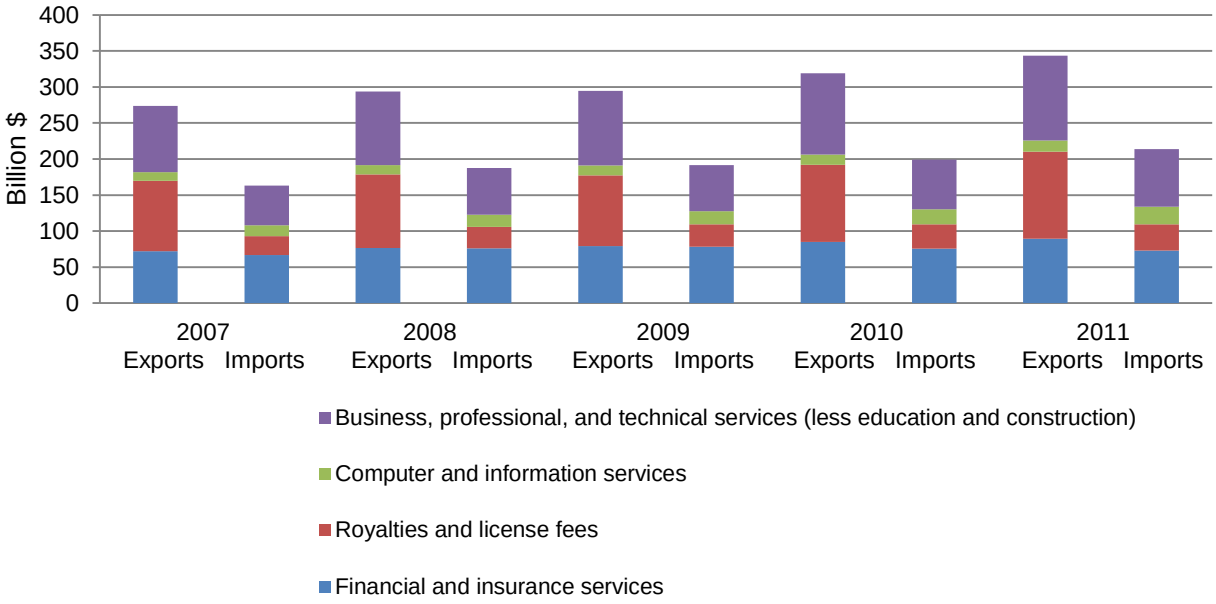
[11] Bermuda is a leading international issuer of reinsurance (insurance for insurance companies) and captive insurance (self-funded insurance vehicles created by private companies). Bermuda's location and its currency, which is pegged to the U.S. dollar, have allowed it to be a primary source of U.S. international insurance. USITC, *Property and Casualty Insurance Services*, March 2009, 3-16, box 3.4.

FIGURE 4.2 U.S. exports (receipts) and imports (payments), other private services and royalties, 2011



Source: USDOC, BEA.

FIGURE 4.3 U.S. export receipts and U.S. import payments for selected digitally enabled services, 2007–11[a]



Source: USDOC, BEA.

[a]Industry sectors defined as digitally enabled by BEA. For further info, see Borga and Koncz-Bruner, "Trends in Digitally-Enabled Trade in Services," 2012.

Business, Professional, and Technical Services

The largest BEA-defined category of digitally enabled U.S. services exports and imports is business, professional, and technical services, a broad group including a variety of services sectors (see footnote 7 for a list of breakouts under this category). Many of this category's subsectors, such as computer and information services, are inherently digitally intensive, and others are known to make intensive use of digital resources (e.g., architectural services). Chapter 3 of this report describes types of digital services that would appear in this category in more detail.

The fact that the value of exports and imports of business, professional, and technical services (not counting construction) are relatively high (exports were $133.1 billion and imports were $104.1 billion in 2011), and that they grew by 28 and 49 percent respectively over the 2007–11 period, suggests that U.S. cross-border trade in digital products and services is robust and growing. Computer and information services exports alone grew by 29 percent to $15.5 billion, while imports grew by 62 percent to $24.5 billion. Imports of computer and information services have been consistently larger than exports, due to outsourcing of computer services.

Financial reports from major U.S. Internet companies also support the services data analysis. Social networking firm Facebook's advertising revenues, excluding those from Canada and the United States, grew from $305 million in the first quarter of 2011 to

$435 million in the first quarter of 2012, or by 43 percent.[12] LinkedIn, an online professional network, had foreign revenues[13] that grew from $66 million in 2010 to $353 million in 2012, or by 435 percent over the two years.[14] Simultaneously, Google's foreign revenues from advertising and non-advertising sources (including revenues of its recently acquired Motorola subsidiary in 2012) grew by 74 percent from 2010 to 2012, rising from $15 billion to $27 billion.[15]

Royalties and License Fees[16]

U.S. receipts of royalties and license fees for rights to use, reproduce, and distribute digital products and services dipped after 2008 from $102.1 billion to $98.4 billion in 2009, but then grew substantially to reach $120.8 billion in 2011 (figure 4.3). U.S. payments abroad for imports in this category, which are substantially lower than receipts, grew 38 percent, from $26.5 billion to $36.6 billion, over the 2007–11 period.

U.S. providers of entertainment services have increased their exports and foreign revenues in recent years, according to industry associations. For instance, the International Federation of the Phonographic Industry's 2012 *Digital Music Report* found that annual digital music trade revenues grew by 8 percent from 2010 to 2011, to $400 million.[17] Additionally, entertainment software publishing firm Activision Blizzard reported that its revenues from foreign sources (excluding North America) increased 15 percent during the same period, rising to $2.4 billion.[18]

Financial and Insurance Services

Cross-border trade in financial services is likely to be conducted via digital networks, even though the BEA does not differentiate between digital and analog transactions. U.S. exports of financial and insurance services grew by 24 percent to $89.5 billion during 2007–11. Imports also increased over this period by 9 percent, although they fell back from their peak in 2009 at $78.2 billion to $72.8 billion in 2011, likely as a result of the ongoing difficulties in the European financial sector. Financial and insurance services are discussed in chapter 3 of this report, as well as later in this section with regard to Census e-commerce data.

[12] Facebook's annual advertising revenues from the world totaled $1.57 billion in 2011 and $2.21 billion in 2012. Facebook, "Form 10-K," January 29, 2013, 40.

[13] Although not broken out by type in the company's 10-K report, LinkedIn's revenue comes from three sources: subscriptions, advertising, and recruiting services. Shinal, "LinkedIn's Diverse Revenue Stream," February 18, 2013.

[14] LinkedIn, "Form 10-K," February 19, 2013.

[15] Google, "Form 10-K," January 29, 2013.

[16] Royalties and license fees are paid to use, reproduce, and distribute intellectual property embedded in books, records, and tapes; broadcasts and recordings of live events; general-use computer software, and other intangibles. BEA, "International Services 1999–2011," 2012, table 1, footnote 4.

[17] IFPI, *Digital Music Report 2012,* 7 (accessed March 25, 2013).

[18] Activision Blizzard, "Form 10-K," February 22, 2013. Video streaming service Netflix also files a public 10-K document and has international revenues. However, Netflix began foreign operations in late 2010 and posted a loss in 2011, with positive foreign earnings in 2012. Jenks, "Domestically Funding International Growth," March 21, 2013; Netflix, "Form 10-K," February 1, 2013.

Services Data Caveats

One drawback of U.S. government services data is that they are available only at the industry level. While trade data for U.S. goods are presented for more than 10,000 differentiated products, trade data for services are aggregated into just 35 service sectors. The exemption level allowing firms to forego submitting a BEA questionnaire on their services business is also high. Rather than the $2,500 level for goods transactions, service providers are only required to fill out a survey if their receipts (exports) are greater than $2 million or their payments (imports) on transactions exceed $1 million.[19] Moreover, intellectual property migration, whereby firms locate their intellectual property in affiliates with favorable tax accounting laws (for example, Ireland and Bermuda), may affect both the location and the direction of royalties and licensee fee trade and investment.[20] It is also impossible to know the method by which services were delivered. For instance, to generate trade in consulting services, a consultant could fly to a foreign country to render a service, prepare and airmail a physical document, or email a document from the United States to a foreign client. Only emailing would be considered digital trade under this study's definition, as explained in chapter 1.

Although industry generally applauds the attempt to quantify international digital trade, some have noted that estimates derived from services data are likely too low because the data are gathered through imprecise survey and statistical means.[21] There is also no means by which to track non-monetary aspects of transactions in services (e.g., the number and size of traded digital files) because there is no volume measurement associated with the services data.[22] Also, inter-company communications within a global corporate group and their associated data flows across national borders often have no reported value; these would only be included in estimates of cross-border services trade when they relate to inter-company transactions, such as inter-company transfers of proprietary research and intellectual property.[23]

Foreign Investment and Digital Trade

Data on sales by U.S. majority-owned foreign affiliates (MOFAs) and on U.S. outward FDI flows and stock are also useful to illustrate private companies' interest and investment in digital sectors. These NAICS-based industry statistics illustrate which industry sectors are earning the highest revenues abroad, the industries in which U.S. companies have invested in the past, and the sectors from which U.S. companies expect future returns. The following section uses data from the information sector (defined as industries that fall within the NAICS 51 classification) to illustrate U.S. company investment and returns abroad in digital industries.

[19] USDOC, BEA, "BE-120 (12-2006)," n.d. (accessed March 25, 2013), 3–4.

[20] Lipsey, "Measuring the Location of Production," June 2010, S105; Feenstra et al., "Report on State of Available Data," August 2010, 22–23.

[21] LeDuc, post-hearing brief to the USITC, March 14, 2013, 9.

[22] Mandel, "Data, Trade, and Growth," March 1, 2013.

[23] Industry representative, interview by USITC staff, Washington, DC, February 11, 2013.

Foreign Affiliate Sales

MOFA sales illustrate the activity generated by U.S. production and investment abroad in digital products and services.[24] Sales by U.S. MOFAs to foreign markets have consistently exceeded cross-border U.S. services exports over the 2007–10 period, reflecting in part a high level of U.S. company investment abroad.[25] One reason given for the success and productivity of U.S. foreign affiliates in many industry sectors has been their high use of information technology.[26]

Looking into the NAICS-based information industry category listed in the BEA statistics, which comprises highly digital industries of particular interest to this study,[27] U.S. MOFA sales abroad were $134.1 billion (12 percent of all industries) in 2010. The majority of sales in this sector, 67 percent, went to Europe ($89.5 billion), followed by Australia, Japan and other Asia-Pacific countries ($21.7 billion), Latin America and other Western Hemisphere countries ($16.5 billion), and Canada ($6.3 billion), as illustrated in figure 4.4.

A breakdown by subcategory of the information sector shows that the largest share of U.S. MOFA sales is attributed to software publishers (26 percent), followed by Internet service providers, Web search portals, data processing services, Internet publishing and broadcasting, and other information services (collectively 24 percent), and telecommunications (23 percent). The remainder comprises publishing industries other than software; the entertainment sector, including movies and sound recordings; and finally, broadcasting services (figure 4.5).

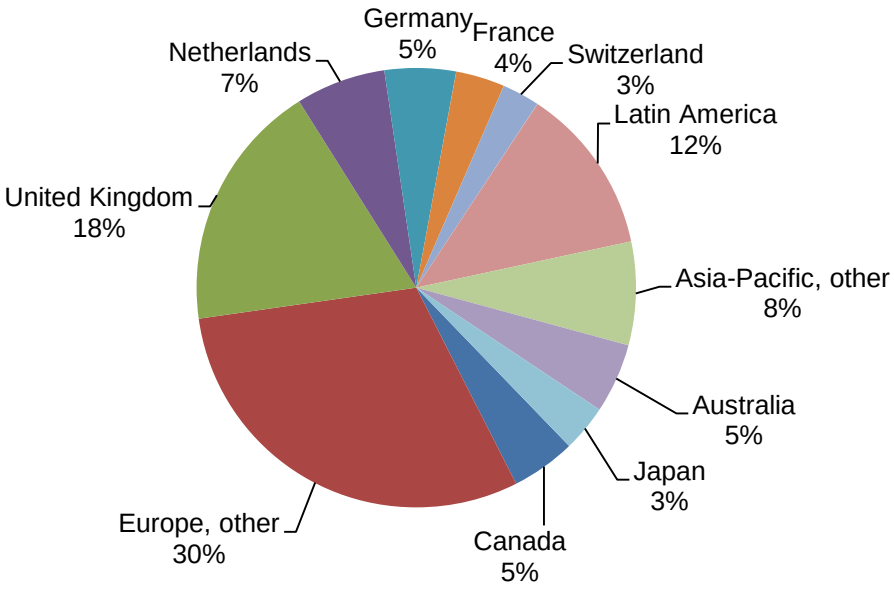
[24] It has been suggested that FDI may be less important than it was in the recent past. This is because digital networks now allow companies to perform international business without a physical presence in a given country. Lee-Makiyama, post-hearing brief to the USITC, March 27, 2013, 2.

[25] Mann, statement to the Senate Committee on Finance, June 2012, 4.

[26] Bloom, Sadun, and Van Reenen, "Americans Do IT Better," 2012. Although it can be assumed that MOFA industries are highly digitally intensive, and the statistics give a general idea of the types of industries U.S. headquartered firms are investing in, it is important to understand that the industry categories used in the BEA services data are based on the affiliate's primary output, not taking into account other items produced by that affiliate or the parent company's industry category. Ibarra-Caton and Sharma, "U.S. International Services," October 2012, 19.

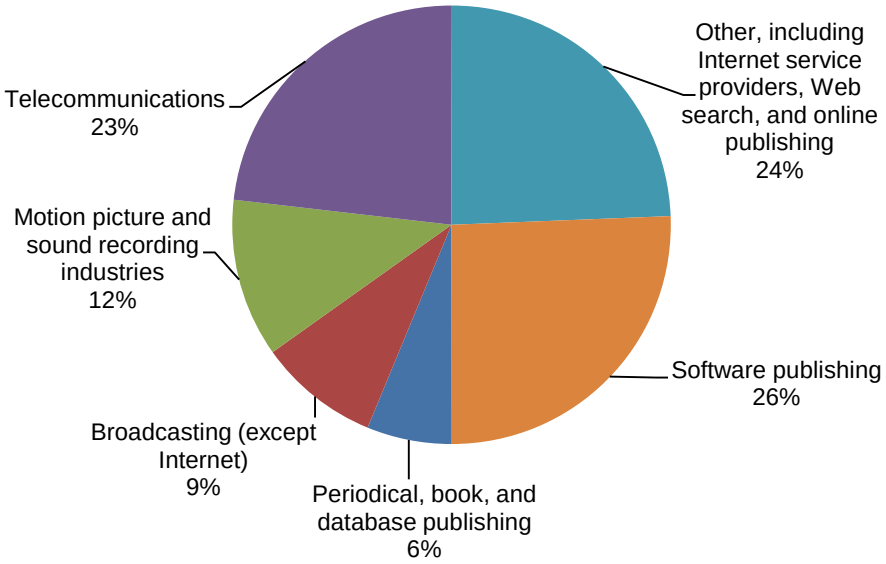
[27] The information sector categories include publishing industries (divided into a newspaper, periodical, book, and database publishers category and a software publishers category); motion picture and sound recording industries (divided into a motion picture and video industries category as well as a sound recording industries category); telecommunications (divided into wired telecommunications, wireless telecommunications carriers except satellite, and other telecommunications); broadcasting (except Internet); and Internet service providers, Web search portals, data processing services, Internet publishing and broadcasting, and other information services.

FIGURE 4.4 Information services supplied abroad by U.S. multinational corporations, through their MOFAs, by country, 2010



Source: USDOC, BEA.

FIGURE 4.5 Information services supplied abroad by U.S. multinational corporations, through their MOFAs, by industry, 2010



Source: USDOC, BEA.

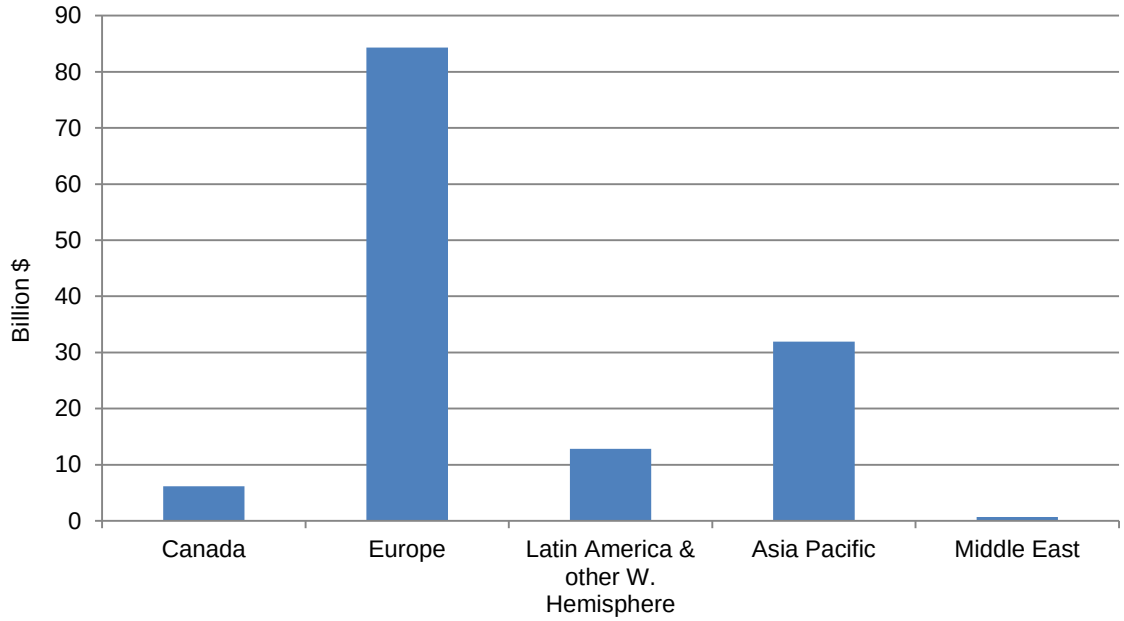
Foreign Direct Investment (FDI) in Digital Products and Services[28]

U.S. FDI statistics for outbound position and annual outflows also illustrate the activities of U.S. information sector companies in global markets.[29] The following section summarizes official U.S. FDI data for the information sector, by country and region. Given the strong market position of U.S. companies in the global information sector, we focus on U.S. outbound investment. For comparison, the discussion below also briefly reviews the smaller level of inbound FDI by foreign companies operating in the United States. In addition, data for individual company investments, both M&A and greenfield projects, shed additional light on the operations of particularly active U.S. companies.

FDI Position and Flows in the Information Sector

The U.S. outbound FDI position by region in the broadly defined information sector in 2011 is summarized in figure 4.6.

FIGURE 4.6 Outbound U.S. investment position in the information sector, 2011



Source: USDOC, BEA.

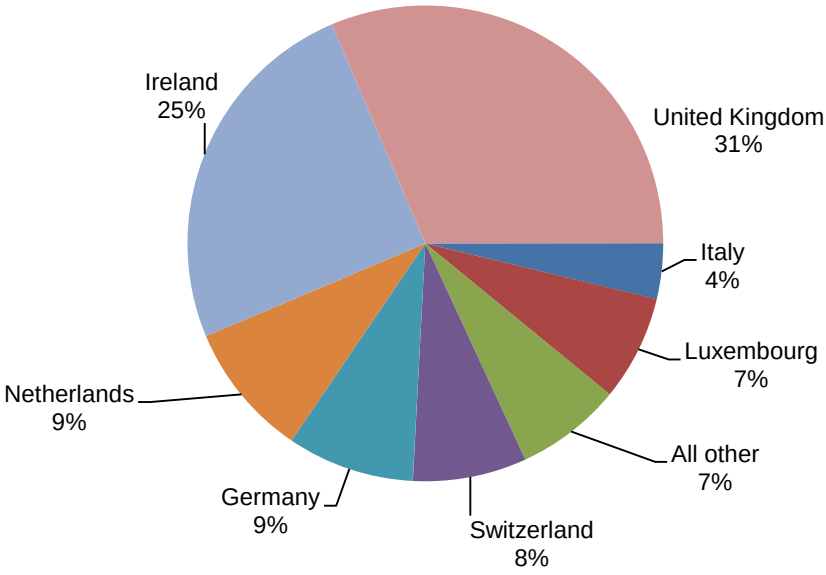
Europe has attracted the largest share by far of investment by U.S. companies in the information sector, followed by the Asia-Pacific region, for three primary reasons. First, the largest share of all U.S. FDI is invested in Europe, and the information sector is in line with the overall trend. Second, Europe is a major foreign market for digital products and services. Third, U.S. firms have directed a large share of their European FDI to Ireland, the Netherlands, and Luxembourg, which reflects the decisions of many U.S.

[28] Data on U.S. foreign direct investment—in particular, investment in digital industries—are quite limited, but what is available is summarized here.

[29] FDI position is a cumulative measure of the existing stock of U.S. holdings of equity in foreign firms. The information sector includes FDI in telecommunications, which is not a focus of this report, but the more detailed data that would make it possible to exclude telecommunications are not available.

companies to locate their intellectual property assets in these low-tax jurisdictions (see figure 4.7).[30]

FIGURE 4.7 U.S. FDI position in the information sector, Europe, 2011

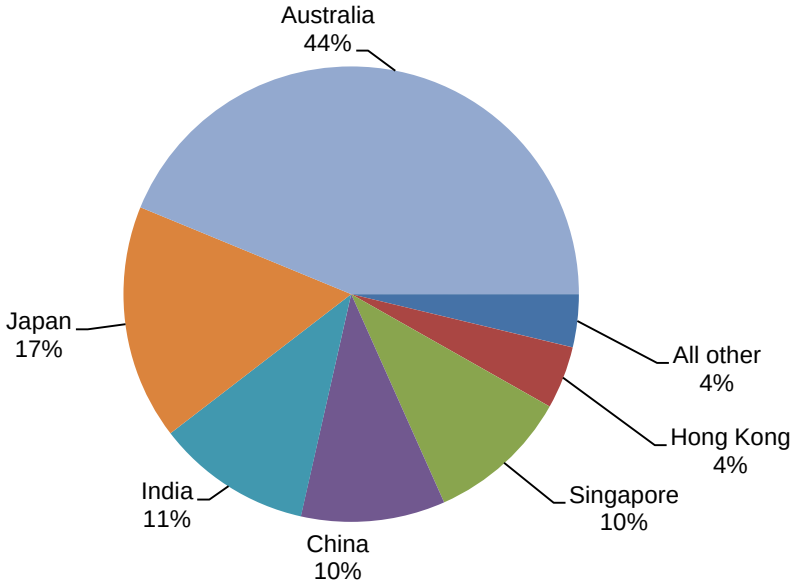


Source: USDOC, BEA.

In the Asia-Pacific region, Australia and Japan together accounted for 61 percent of the FDI position in the information sector, while India and China accounted for 12 and 9 percent, respectively (figure 4.8). Within Latin America and other Western Hemisphere countries (a category that includes Central America, South America, and the Caribbean), Brazil accounted for almost half of the U.S. outbound FDI held in the information sector, followed by Mexico and Bermuda. Together, the three countries accounted for 72 percent of the outbound U.S. FDI position in the region in 2011. However, they exhibit quite different trends, with strong increases in Brazil and Bermuda during the last five years compared to significant declines in Mexico. Notwithstanding the decline in Mexico (a large market), there has been a strong overall increase in U.S. investment in the Latin American region (figure 4.9).

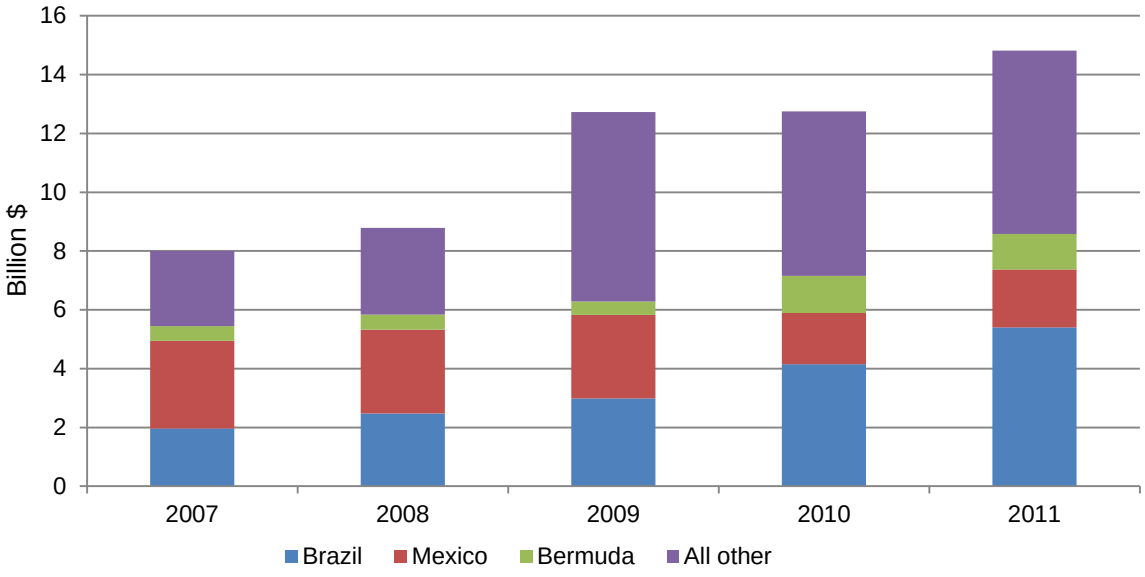
[30] See, e.g., Kleinbard, "Stateless Income," 2011.

FIGURE 4.8 U.S. FDI position in the information sector, Asia-Pacific, 2011



Source: USDOC, BEA.

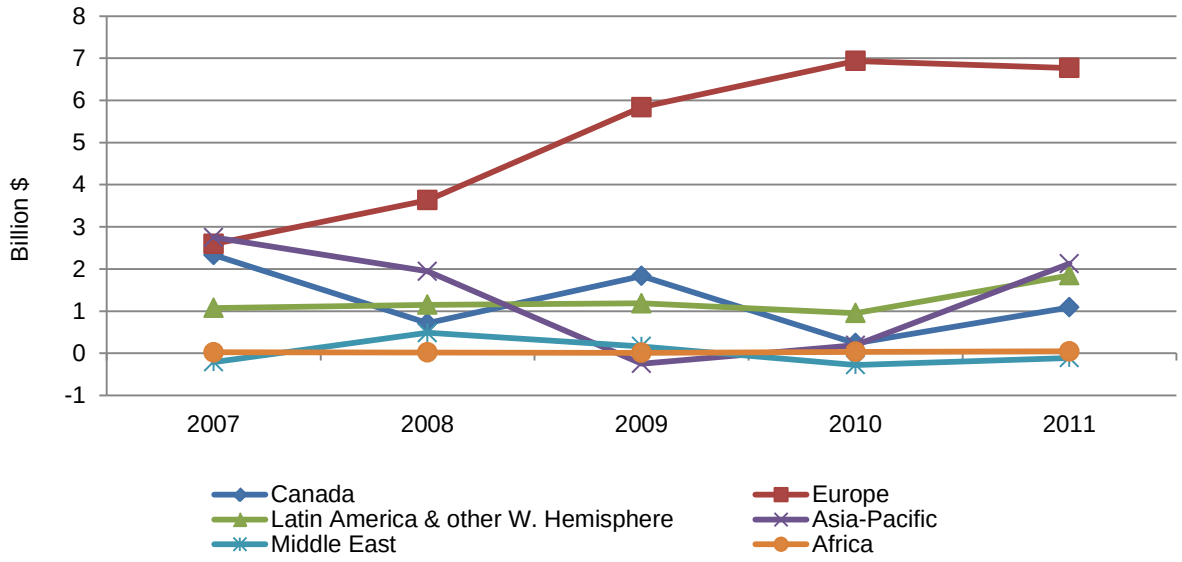
FIGURE 4.9 U.S. FDI position in the information sector, Latin America and other Western Hemisphere, 2007-2011



Source: USDOC, BEA.

FDI outflows show new annual investment, as opposed to FDI position, which represents cumulative investment. Figure 4.10 illustrates annual FDI outflows to the information sector from 2007 to 2011, with by far the largest share of new flows destined for Europe.

FIGURE 4.10 U.S. investment outflows in the information sector, by region, 2007–11



Source: USDOC, BEA.

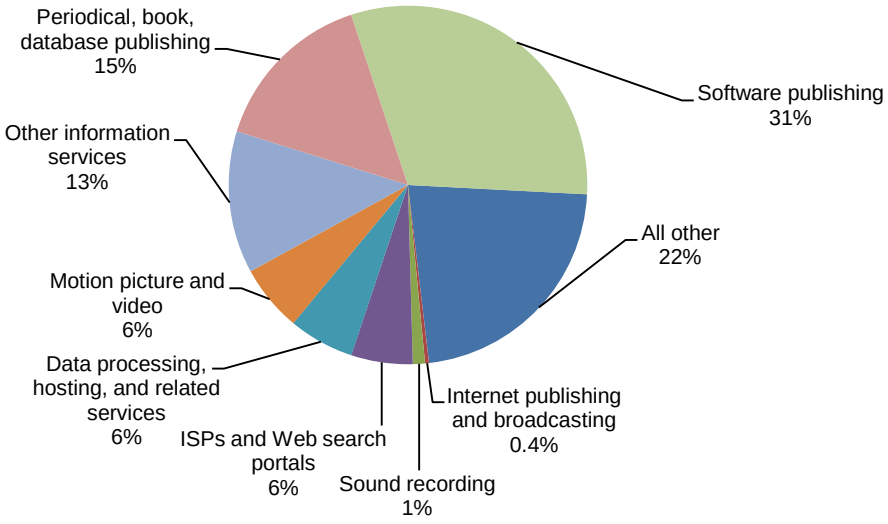
Available data that break out more specific industries within the broad information sector do not provide regional or country-specific information. Figure 4.11 shows the shares for a more detailed list of industries in the total U.S. outbound FDI position in the information sector ($127.2 billion in 2011).[31]

Three industries in the information sector of particular interest to this report are software publishing; motion picture and sound recording; and Internet, data processing, and other information services[32] (figure 4.12). These three industries together accounted for 63 percent of the U.S. outbound investment position in the broader information sector in 2011. Most of the remainder is broadcasting (except Internet) and telecommunications (both of these are included in the "all other" section of figure 4.11); and newspaper, periodical, book and database publishers (most output in this sector remains in physical formats, although digital formats are gaining prominence, as discussed in chapter 2).

[31] BEA, Balance of Payments and Direct Investment Position database (accessed July 5, 2013). This is the same categorization as used in the affiliates discussion earlier in this chapter. See footnote 27 for a list of categories. "Other information services" is part of the broader "Internet, data processing, and other information services," which is listed by BEA as a subgroup of the "information" sector.

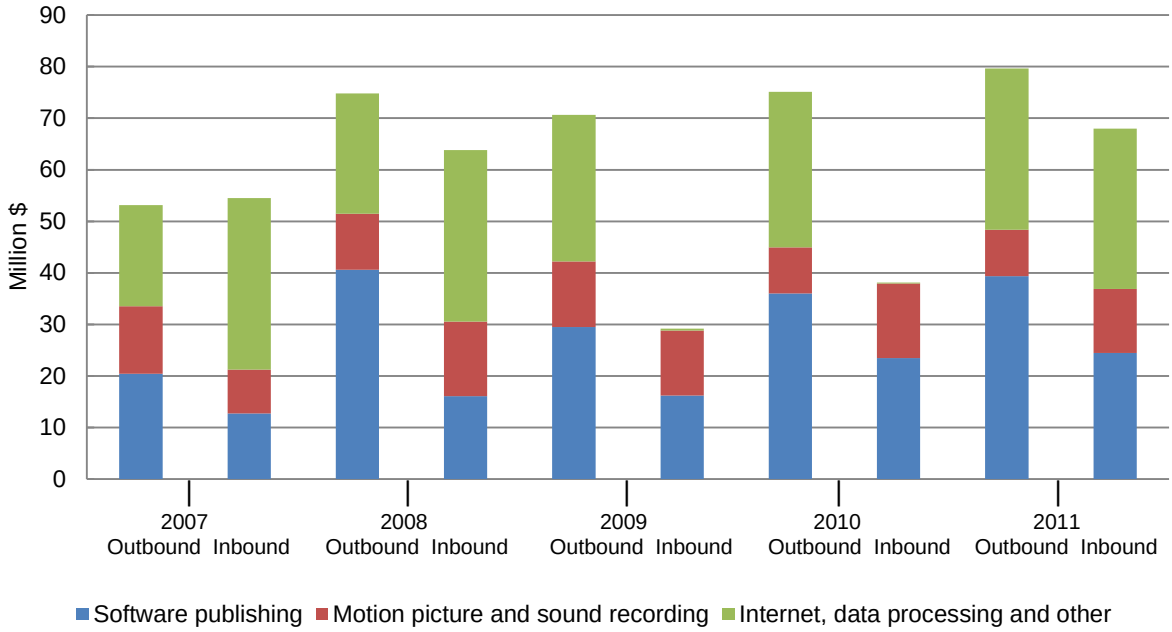
[32] The last industry grouping includes the following categories from the pie chart in figure 4.5 above: Internet publishing and broadcasting; ISPs and Web search portals; data processing, hosting, and related services; and other IT services.

Figure 4.11 Outbound FDI position by industry, by share of the information sector, 2011



Source: USDOC, BEA.

FIGURE 4.12 U.S. FDI outbound and inbound position, selected digital industries, 2007–11[a]



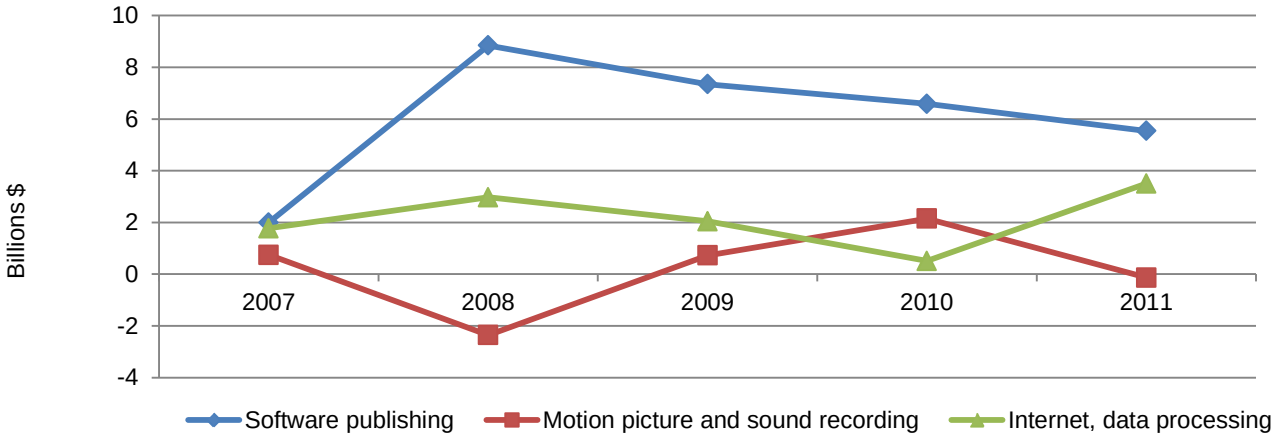
Source: USDOC, BEA

[a]Inbound foreign investment position for "other information services" is not reported in 2009–10 to avoid disclosure of information of individual companies.

In comparison, the inward foreign investment position in the U.S. information sector—$147.1 billion in 2011—is larger overall, but is more concentrated in the non-digital subsectors (broadcasting and telecommunications). The inward foreign investment position for software publishing is significantly smaller than the U.S. outward investment position, both in absolute and percentage terms. The inward investment position in the motion picture and sound recording industries is slightly larger than outward investment position in this sector, but accounts for a similarly small share of investment in the broader information sector in both directions. Foreign investment in the U.S. data processing, hosting and related services sector is negligible, illustrating the comparatively strong global position of U.S.-based firms in these industries. About 21 percent of the foreign investment position in the U.S. information sector is in "other information services," but data for Internet publishing and broadcasting; Internet service providers and Web search portals; and other IT services are not reported separately.[33]

Figure 4.13 illustrates the most recent annual FDI outflows—U.S. firms' investments abroad by year—in the same industries. Outbound FDI in software publishing was significantly higher than outbound FDI in the Internet, data processing, and other information services sector in 2008–11. Outbound investment in the motion picture and sound recording category fell negative in 2008 before recovering somewhat in 2009 and 2010 and falling back to close to zero in 2011.[34]

FIGURE 4.13 U.S. FDI outflows in selected digital industries, 2007–11



Source: USDOC, BEA.

M&A and Greenfield Investment by Leading U.S. Internet Companies

FDI statistics include transactions of two principal types: greenfield (i.e., new) FDI, and mergers and acquisitions (M&A) of existing firms or operations. One recent forecast of greenfield FDI activity predicts that cloud computing and social media (as well as wind power) will be the industries with the fastest investment growth from 2010 to 2015.

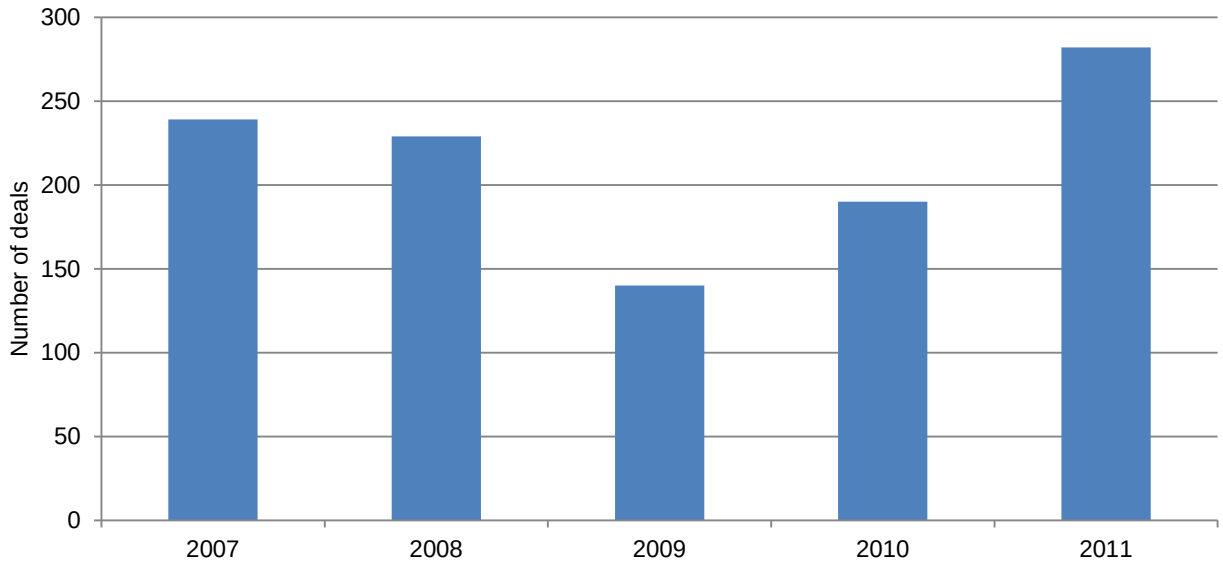
[33] BEA, Balance of Payments and Direct Investment Position database (accessed July 5, 2013). Data for some subsectors were suppressed by BEA, to avoid disclosing information of individual companies.

[34] Ibid. It should be noted that 85 percent of total FDI position and 96 percent of annual outflows in this sector in the most recent five-year period were invested in the motion picture industry, rather than the sound industry.

Greenfield FDI projects in cloud computing are expected to triple by 2015, compared with 2010, and social media projects are expected to nearly double in that same period. Cloud computing is expected to account for 12 percent of all greenfield FDI projects in the broader software and IT industry in 2015.[35]

While official statistics do not provide specific details on individual investment transactions by firms in the information sector, a database search of greenfield FDI or M&A transactions involving relevant firms can shed some light. A search of outward M&A transactions from 2007 to 2011 involving U.S. firms that provide digital content or other Internet-based services[36] yielded a list of almost 1,100 acquisitions by U.S. companies of foreign firms all over the world (figure 4.14). Many of these were private transactions with values not publicly reported. However, for the 308 deals for which values were reported, the average transaction value was $138 million, with a wide range of values from under $10 million to $8.5 billion. The lower level of M&A activity seen in 2009 and 2010 likely reflects global economic conditions rather than factors specific to the information industry.[37]

FIGURE 4.14 Number of mergers and acquisitions by U.S. companies, selected digital industries, by year



Source: Bureau van Dijk, Zephyr M&A database.

[35] fDi Intelligence, "Improving the Quality of Foreign Direct Investment," July 2012, 5.

[36] Firms in the relevant industries involved in M&A transactions abroad were identified by NAICS code (based on the industry of the acquirer) for subsectors of the information sector that include digital content and service providers.

[37] Bureau van Dijk, Zephyr M&A database (accessed April 16, 2013).

The following timelines (figure 4.15) illustrate the recent foreign investment activities of selected U.S. companies in digital industries: Amazon, Autodesk, Google, IBM, Microsoft, Oracle, and Yahoo sales.[38] These companies have been among the most active overseas investors in digital industries in recent years.

All of these companies have been active in expanding their foreign operations, through both greenfield investments (shown in green) and foreign acquisitions (shown in red).[39] Some companies have been expanding their digital services operations abroad steadily over the past several years (Autodesk, Google, Oracle, and Yahoo), while others have been intensely active more recently (Amazon and IBM).[40] Google and Microsoft account for the largest number of foreign investment transactions; both companies primarily invest abroad through greenfield transactions. By far the largest of these transactions are Microsoft's acquisition of Skype (Luxembourg), a voice communications technology holding company for $8.5 billion in 2011,[41] and IBM's acquisition of Cognos (Canada), a developer of business intelligence software, for an estimated $5.0 billion in 2007.[42]

[38] Data based on Bureau van Dijk, Zephyr M&A database, and Financial Times, fDi Markets greenfield investment database (accessed April 16, 2013). Most transaction values are not reported, but values are included where the information is available. Reported transaction values have not been individually verified with the companies involved.

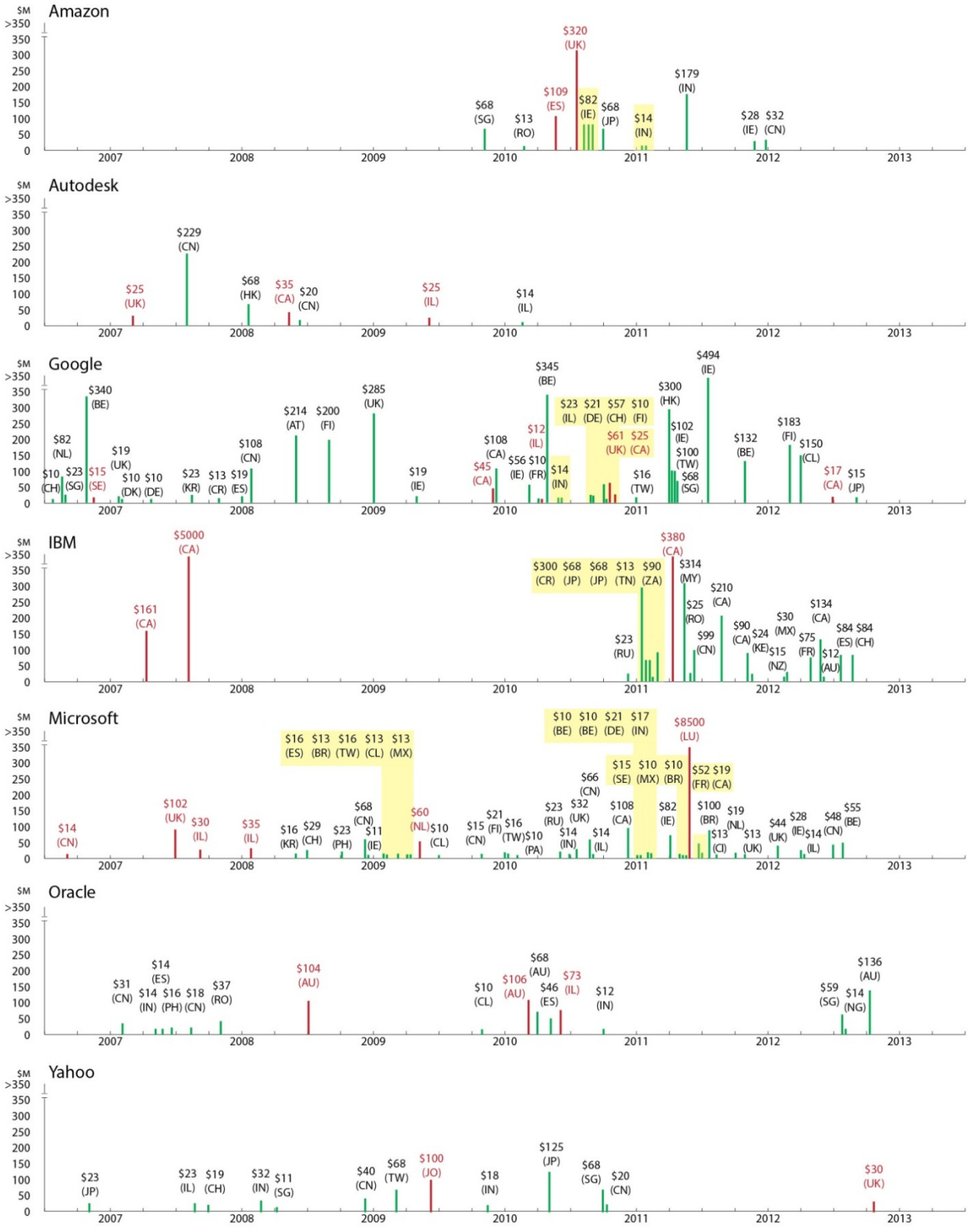
[39] Greenfield transactions are those in which the U.S. investing company creates a new company abroad. Acquisitions are transactions in which a U.S. company acquires an existing foreign firm.

[40] For Amazon, foreign acquisitions that do not relate to the digital aspects of the company (primarily warehouse and distribution centers) have been omitted from the list.

[41] Microsoft, "Microsoft to Acquire Skype," May 10, 2011.

[42] The IBM-Cognos acquisition was finalized in January 2008. IBM, "IBM to Acquire Cognos," November 12, 2007; Bureau van Dijk, Zephyr M&A database, (accessed May 23, 2013).

FIGURE 4.15 Foreign direct investment by selected U.S. Internet companies, 2007–12



Country Abbreviations

AU - Australia
BE - Belgium
BR - Brazil
CA - Canada
CH - Chile
CI - Cote d'Ivoire
CN - China
CR - Costa Rica
DE - Germany
DK - Denmark
ES - Spain
FI - Finland
FR - France
HK - Hong Kong
ID - Indonesia
IE - Ireland
IL - Israel
IN - India
JP - Japan
KE - Kenya
KR - South Korea
LU - Luxembourg
MX - Mexico
MY - Malaysia
NG - Nigeria
NL - Netherlands
NZ - New Zealand
PA - Panama
PH - Philippines
RO - Romania
RU - Russia
SG - Singapore
SE - Sweden
SW - Switzerland
TN - Tunisia
TW - Taiwan
UK - United Kingdom
ZA - South Africa

Legend

Green line (▌): Greenfield investment
Red line (▌): M&A investment
Yellow shading (▭): Similar date transaction details

Global Services Trade Data and Other Measures of International Digital Trade

This section offers additional data related to international trade in digital products and services. First, OECD data are used to put U.S. digital trade in the context of global trade in these industries. Next, the section presents data for U.S. exports and imports related to e-commerce. Finally, the chapter briefly addresses quantification of cross-border data flows.

OECD Services Trade Data

Similar to the BEA, the OECD collects and compiles official services statistics from its members and other countries.[43] For the information sector, data are available only for OECD members and a handful of other countries. However, as these data describe trends in all developed markets, they likely capture the majority of international trade in digital services globally.[44]

While the United States is both the largest exporter and the largest importer of digital services among OECD members (figure 4.16), Germany, France, the United Kingdom, and Ireland were also large-scale exporters and importers of these services. It is not surprising that these economies appear as top digital services traders, given the size and trade-intensity of the German and French economies (and consequently their sizable transfers of business process intellectual property), the United Kingdom's dependence on international financial sector transactions (which are largely conducted over digital networks), and Ireland's strong technology industry and status as a favorable tax location, especially for intellectual property.[45]

These theories are borne out by a closer inspection of the breakdowns of exports and imports by services category for France, Germany, Ireland and the United Kingdom (see figure 4.17). While the broad "other business services"[46] category is the leading export and import sector for three of the four countries, the next leading categories provide some more insight. Notably, financial services is the second-highest export and import value category for the United Kingdom, and royalties and license fee imports and exports are high for both France and Germany. Ireland is the exception: computer and information services are the country's highest export category, consistent with its large tech industry.

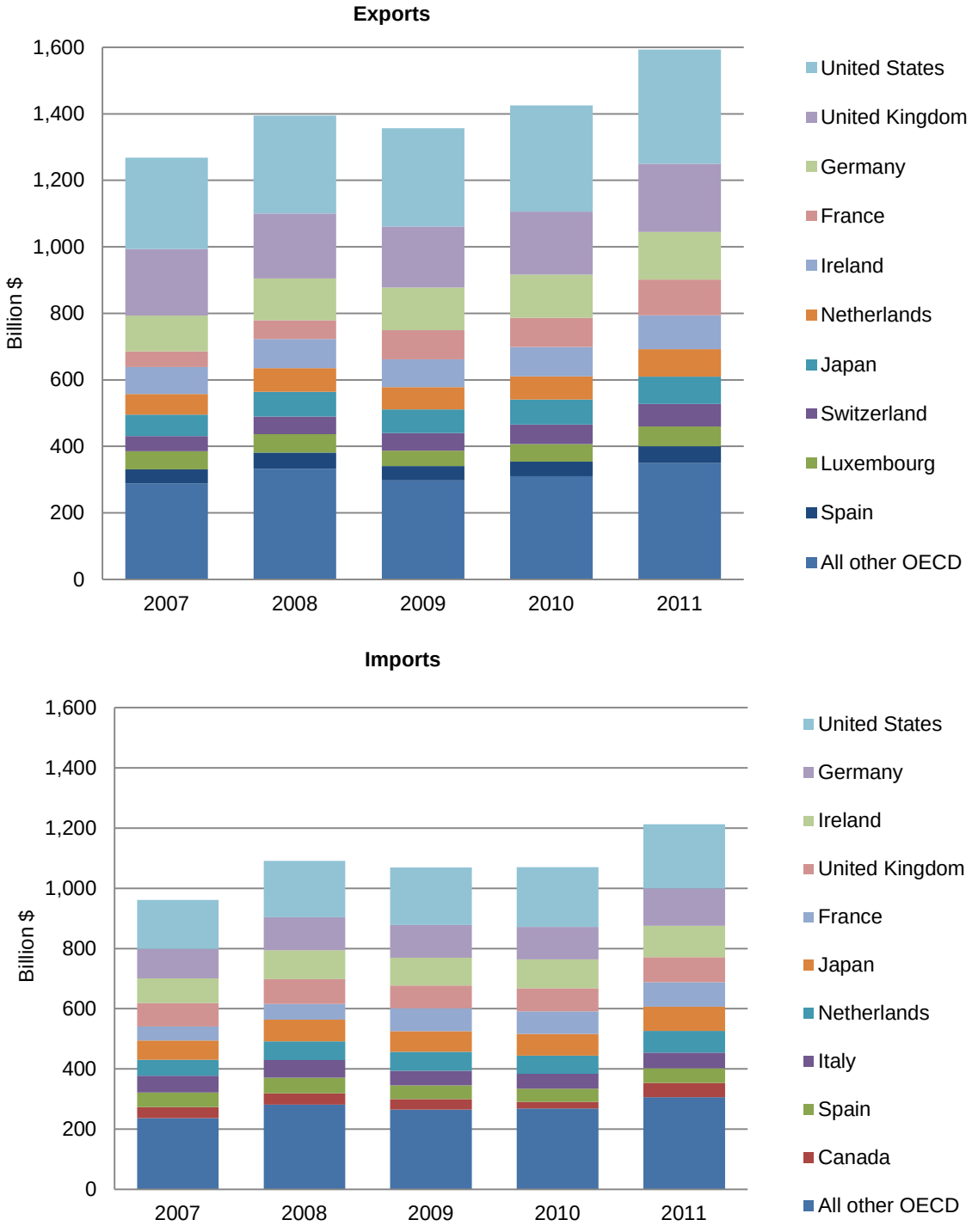
[43] Like the United States, most countries base their services trade data on surveys structured around the International Monetary Fund's Balance of Payments Manual, fifth edition (BPM5). However, comparing international data has the added complication that every country generally submits its surveys to different sample populations and compiles its statistics differently before submission.

[44] OECD data for comparative foreign MOFA sales analysis were not available. The EU does collect members' foreign affiliates trade statistics (FATS) within Eurostat and some data for 2010 are available; however, these data are not easily compiled and analyzed. The EU switched reporting requirements for its members from NACE 1.1 to NACE 2 categories in 2010, creating a time-series inconsistency. Despite this, the numbers generally show an increase in 2008 and a sharp decline in 2009 of outward sales by foreign affiliates, which would imply that the global recession and Eurozone difficulties were strong influences. However, without better data it is impossible to conclude definitively.

[45] Lipsey, "Measuring the Location of Production," June 2010, S105; Feenstra et al., "Report on State of Available Data," August 2010, 22–23.

[46] "Other business services" contains aggregated information for merchanting and trade-related services; operational leasing; and miscellaneous business, professional, and technical services, such as legal, advertising, and architectural services. OECD, "Service: 268: Other Business Services" (accessed April 5, 2013).

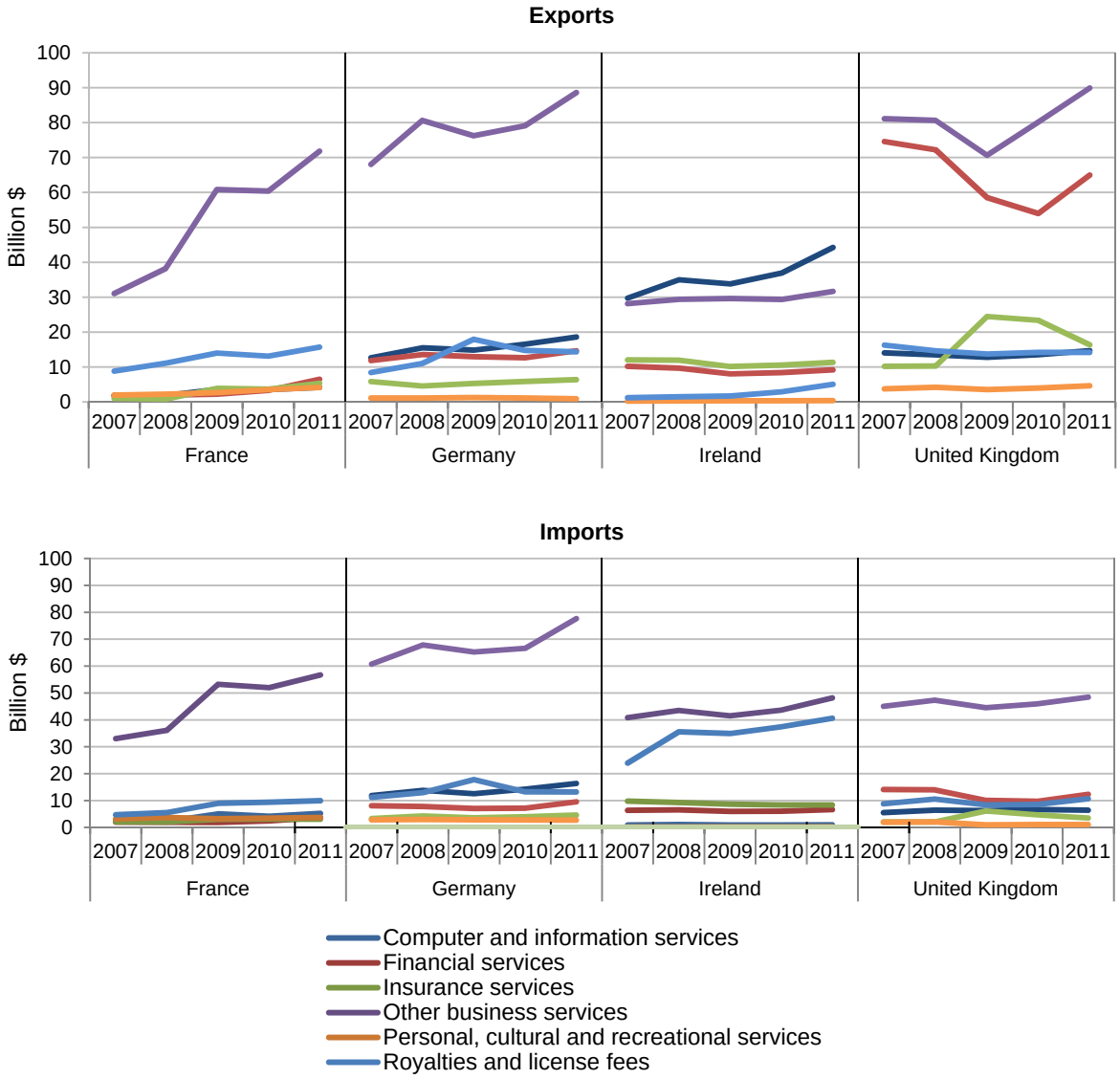
FIGURE 4.16 OECD digitally enabled services, exports and imports 2007–11[a]



Source: OECD, Statistics on International Trade in Services database (accessed July 1, 2013).

[a]The categories included were insurance services; financial services; computer and information services; royalties and license fees; other business services; and personal, cultural, and recreational services.

FIGURE 4.17 OECD, exports and imports in selected digital services industries, selected countries, 2007-11



Source: OECD, Statistics on International Trade in Services database (accessed July 1, 2013).

E-Commerce and Other Measures

Besides services trade data, there are a few other methods that researchers have used to try to evaluate international digital trade—most prominently, goods trade facilitated by the Internet, and, very recently, data flows themselves (box 4.1).[47] The U.S. Census

[47] Most e-commerce, that is, the sales of physical goods transacted online, is not included in this report's definition of digital trade (see Chapter 1). However, as we discuss in Chapter 3, trends in e-commerce provide additional insight into the impact of Internet technologies on other sectors of the economy.

BOX 4.1 Mapping international digital data flows

Cisco, a leading network systems provider, estimates that global Internet Protocol (IP) traffic increased by four times in the previous five years, reaching 44 exabytes per month on average in 2012. However, there is significant variation in data traffic flows within each day, week, and month. [a]

Some researchers have noted that international data flow volumes might be a helpful indicator of international digital trade. This report, however, does not define international digital trade in terms of data flows, as "data moves" (data traffic, measured in bits) do not correspond to the value of international digital trade flows. One reason is that commercial transactions do not always accompany data. For instance, "peering" agreements between networks allow traffic to traverse different networks' infrastructure without payment;[b] in another example, multinational companies frequently send valuable, but non-monetized, data to affiliates.[c] In addition, the sheer size of video files relative to other forms of data files creates a potentially large volume-to-value mismatch[d] because any data flow measure would likely comprise primarily videos.[e]

Although the amount of Internet traffic coursing between countries, measured in bits, is difficult to measure and is in constant flux, it is possible to gauge the amount of international traffic by examining the levels of bandwidth provisioned by telecommunication carriers, Internet service providers, content providers (like Google and Facebook), and other networking companies on the terrestrial and submarine fiber optic networks running between cities in different countries.[f] The Internet is structured as a hub-and-spoke system: hubs are the Internet exchanges located in cities around the world, and the spokes are the fiber optic cables that run between these exchanges. As a result, one of the best ways to see major international Internet trade patterns is to examine the bandwidth provisioned between cities. For nearly two decades after the start of the Internet era in the 1990s, the "spoke" with the best-provisioned bandwidth was the London-New York route. In 2009, however, the transatlantic route was eclipsed by the London-Amsterdam route; by 2011, the leading route was Frankfurt-Paris. In 2011, more than half of the world's top 50 routes ran between cities in Europe, and the spokes running between and among London, Paris, Frankfurt, Amsterdam, and Brussels were among the highest-capacity networks worldwide. Other important spokes include New York-London, Washington-Paris, Miami-Buenos Aires, Miami-São Paulo, and Tokyo to Los Angeles, to San Francisco, and to Hong Kong.

It is also possible to gain some insight into international Internet traffic by examining the bandwidth provisioned between cities grouped into regional categories. In 2012, the highest-capacity interregional route was that between the United States-Canada region (U.S./Canada) and Europe, with a total of 7.9 terabits per second (Tbps) of provisioned bandwidth This was followed by the U.S./Canada–Asia and U.S./Canada–Latin America routes, which each had bilateral provisioned bandwidth of more than 6 Tbps. Although the three highest-capacity interregional routes are still centered on the United States-Canada region, its importance has declined in relative terms as robust interregional networks have developed in other parts of the world, particularly Asia. Efforts by telecommunications carriers and Internet service providers to develop more geographically diverse network routes has also contributed to the decline in the share of international network capacity connected to the United States and Canada. (For a more detailed overview of the Internet communications infrastructure, see appendix E.)

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[a] Cisco, "The Zettabyte Era—Trends and Analysis," 2013, 4. An exabyte is a unit of measure of digital information. 1 exabyte is equivalent to 1,000 petabytes or 1 billion gigabytes. One zettabyte is equivalent to 1,000 exabytes.

[b] Mandel, "Data, Trade, and Growth," March 1, 2013, 14.

[c] Industry representative, interview by USITC staff, Washington, DC, February 11, 2013.

[d] Black, post-hearing brief submitted to the USITC, March 2013, 2.

[e] Mandel, "Data, Trade, and Growth," March 1, 2013, 5.

[f] TeleGeography, *Global Internet Geography*, 2013, 3; TeleGeography, *Global Internet Map*, 2012.

collects survey statistics annually and estimates the share of e-commerce in different NAICS-based industries. The Census definition of e-commerce is essentially any sale that was executed through the Internet.[48] These transactions include both national and international sales, which muddies the analysis of the data as it is not feasible to separate

[48] Census website, http://www.census.gov/econ/estats/definitions.html#e (accessed March 24, 2013).

the two.[49] Reported e-commerce in services has increased every year since 2007.[50] The level and growth of e-commerce for NAICS-based industries of interest to this study are listed below in table 4.2. All show growth except for Internet service providers; the latter trend might be a result of the limited data availability.

TABLE 4.2 2010 select Census e-commerce statistics

NAICS	Sector	2010 e-commerce (Billion $)	CAGR (%) from 2007
51	Information	55.34	4.2
511	Publishing industries (except Internet)	22.17	4.9
51811	Internet service providers	6.49	[a] -8.1
52	Finance and Insurance	50.82	[a]10.3
54	Selected professional, scientific, and technical services	25.41	7.0

Source: USDOC, Census.

[a]Compound annual growth rate was calculated from 2009 rather than from 2007 because no earlier statistics were available.

eBay has also conducted a study on a small sample of international e-commerce transactions performed through their service. eBay's sample included business-to-consumer international commercial sales between 69 country pairs, principally for transactions valued at over $10,000. Using an eBay dataset, the researchers developed an econometric model to control for the GDPs of the countries involved in the transaction and for the distance between them. Using this model, they found that exporting is easier through eBay, with sellers experiencing lower costs and trade barriers. They also found that the Internet facilitates exports by small sellers, which may not have been possible previously.[51]

[49] Companies report their overall e-commerce receipts, both domestic and international, to Census and follow the U.S. Internal Revenue Service reporting practices. The e-commerce numbers reported are not comparable to services data and do not contain transactions made by U.S. foreign affiliates in other countries outside the United States. Government official, telephone interview by USITC staff, May 22, 2013.

[50] Census website, "U.S. Selected Services Revenue" (accessed March 24, 2013).

[51] eBay, "Enabling Traders to Enter and Grow," March 2012, 10.

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CHAPTER 5
Notable Barriers and Impediments to Digital Trade

Industry participants and experts who were consulted at the Commission's hearing and in fieldwork pointed to the following categories of nontariff measures (NTMs) that may operate as barriers or impediments to digital trade.

Localization measures: These are defined as measures that compel companies to conduct certain digital trade-related activities within a country's borders. They include policies that require data servers to be located in-country; policies requiring local content; and government procurement preferences and technology standards that favor local digital companies. These policies limit market access and may result in higher costs and sub-optimal processes for U.S. firms.

Data privacy and protection measures: Divergent approaches to data privacy and protection, particularly as regards the United States and the European Union (EU), reportedly impose substantial costs and uncertainty on firms, especially small and medium-sized enterprises (SMEs). Industry representatives across digital industries highlighted the need to find common ground and interoperability in regulatory approaches to data privacy and protection.

Intellectual property rights (IPR)-related measures: Representatives of digital content providers and of Internet intermediaries[1] reported substantial, although different, IPR-related concerns. Representatives of the content industries—including software, music, movies, books and journals, and video games—identified Internet piracy as the single most important barrier to digital trade for their industries. By contrast, representatives of intermediaries were concerned about being held liable for the intellectual property-infringing or illegal conduct of users of their systems. Both content providers and intermediaries stressed the importance of laws—like the U.S. Digital Millennium Copyright Act (DCMA) and Section 230 of the Communications Decency Act (CDA)—that properly balance their respective rights and responsibilities, and raised concerns about the lack of clear frameworks in some other countries.

Censorship measures: Representatives of Internet intermediaries and digital content providers reported that online censorship of digital content and platforms is pervasive and growing. Digital content representatives noted that onerous content review systems in China and Vietnam, for example, shorten the window period for the legitimate distribution of digital products and cede the market to pirated content. Internet intermediaries compared the blocking and filtering of online platforms and content to customs officials stopping all goods from a particular company at the border; the negative economic effects can be substantial.

[1] This chapter adopts the OECD's definition of Internet intermediaries to include firms that bring together or facilitate transactions on the Internet by giving access to, hosting, transmitting, and indexing content, products, and services originated by third parties. OECD, *The Economic and Social Role*, April 2010, 9.

Border measures and limits on immigration: Internet intermediaries also noted that traditional impediments—such as border measures and regulatory complexity—can substantially impede online business, particularly that of SMEs. Some firms in the digital sector also noted difficulties associated with immigration restrictions.

While the request letter for this investigation seeks information on notable barriers and impediments to digital trade, many experts consulted also identified affirmative principles necessary to foster the growth of digital industries and the dynamism of the Internet. First, and most importantly, experts stated that the free flow of data and information within and across countries should be the norm; any necessary restrictions should comply with existing trade disciplines such as non-discrimination, national treatment, transparency, and proportionality. Next, experts stated that regulations should strive for common ground across countries to minimize burdens on digital industries, particularly SMEs. Moreover, Internet governance should be consensus-driven, transparent, and based on input from all stakeholders to foster the trust that the Internet will work as expected—a trust that is required for digital trade to flourish.

Digital Trade Localization Measures

Government measures that compel digital companies to use local data servers, technology, and inputs, or that offer procurement preferences to local companies, may limit the ability of foreign companies to compete in the country implementing the measure.[2] A measure that requires the use of local inputs for digital products and services may force companies to exit the market or limit their supply chain options. When companies find local inputs or local operations to be cost-effective or strategic, they localize without the need for a government requirement. Thus, government measures of this type may create "localization barriers to digital trade" (box 5.1).

Localization barriers to digital trade are evolving in step with the growth of digital products and services.[3] Many of the measures have operated only for a short time, have not been clarified, and reportedly are applied unequally and unpredictably.[4] As one observer noted: "These internet restrictions are also frequently vague, not easily understood and are administered in an arbitrary and non-transparent manner."[5] To organize the analysis in this chapter, the measures are divided into three categories: those that require companies to store data locally; those that mandate or encourage certain levels of local content; and those that provide government procurement preferences to local firms in the digital sectors (table 5.1).

[2] USITC, hearing transcript, March 7, 2013, 25, 38, 70, 157, 161, 186, 216, 232, 318 (testimony of Stephen Ezell, Information Technology & Innovation Foundation; of Joshua Meltzer, Brookings; of Jake Colvin, National Foreign Trade Council; of Ed Black, Computer & Communications Industry Association; and of David LeDuc, Software & Information Industry Association); ITIF, written testimony submitted to the USITC, March 7, 2013, 1; BRT, "Promoting Economic Growth," 2012, 2–8.

[3] CCIA, written comments to the USTR, May 20, 2013, 6.

[4] Industry representative, cited in Berry and Reisman, "Policy Challenges of Cross-Border Cloud Computing," 2012, 26.

[5] Meltzer, "The Internet, Cross-Border Data Flows," February 2013, 9.

BOX 5.1 Defining localization barriers to digital trade

There is not an established definition for localization barriers to digital trade. In submissions to the USITC, industry representatives and experts used the terms "forced localization," "local data storage requirements," "local content," and "localization barriers to trade" interchangeably. However, these terms generally are not limited to measures that target the transmission or storage of data. For many years, governments have imposed local-content requirements in such areas as information technology and renewable energy in an attempt to foster the growth of domestic industries. Thus, USTR broadly defines the term "localization barriers to trade" as:

> [M]easures designed to protect, favor, or stimulate domestic industries, service providers, and/or intellectual property (IP) at the expense of goods, services, or IP from other countries. Localization barriers are measures that can serve as disguised trade barriers when they unreasonably differentiate between domestic and foreign products, services, IP, or suppliers, and may or may not be consistent with WTO rules.

While localization barriers to trade may encompass a wide range of protectionist measures, this study will use the term "localization barriers to digital trade" to refer to those measures that have been applied to the digital sector.

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Sources: USTR website, "Localization Barriers to Trade," http://www.ustr.gov/trade-topics/localization-barriers (accessed May 6, 2013); World Trade Organization (WTO) website, "Glossary: Local-Content Measure," http://www.wto.org/english/thewto_e/glossary_e/local_content_measure_e.htm (accessed May 6, 2013).

TABLE 5.1 Selected examples of localization barriers to digital trade

Subject matter	Country	Source
Requires local storage of data	Argentina, Australia, Canada, China, Greece, Indonesia, and Venezuela	BSA, BRT, Cate, Citi
Mandates or encourages local content	Australia, Brazil, China, India, and certain EU member states	USTR, BSA, BRT, MPAA
Provides government procurement preferences to local digital firms	Brazil, Canada, China, India, Nigeria, Paraguay, and Venezuela	USTR, BRT

Source: USTR, *2013 National Trade Estimate Report on Foreign Trade Barriers*, 2013; BSA, "Lockout," June 2012, 9; Motion Picture Association of America (MPAA), "Trade Barriers," October 15, 2012, 2; Citi, written submission to the USITC, March 14, 2013, 2; BRT, "Promoting Economic Growth," 2012, 5–6; Cate, "Provincial Canadian Geographic Restrictions," 2008, 1.

Localization barriers to digital trade are distinguished from companies' voluntary decision to localize to lower costs, to get access to the best talent or resources, or to ensure that they meet the needs of consumers in the market.[6] For example, for companies that provide digital services over the Internet, using servers that are geographically closer to the user reduces latency and lowers the probability of dropped or disordered information packets.[7] Thus, providers of cloud services locate servers where they make sense logistically and economically.[8] For digital content producers, localization may be necessary because "It's not enough just to translate. The game needs to be adapted for each market," according to the founder of a Russian game company.[9] Unlike these localization strategies, which are driven by companies' economic needs, measures that explicitly or implicitly require a company to use local digital products and services often thwart optimal business decisions and distort trade.

[6] Industry official, interview by USITC staff, San Francisco, CA, April 16, 2013.

[7] USITC, hearing transcript, March 7, 2013, 45–46 (testimony of Michael Mandel, Progressive Policy Institute). "Latency" is the total time it takes a data packet to travel across a network connection.

[8] BSA, written comments to USTR, May 10, 2013. Cloud computing is discussed in chapter 2.

[9] Khrennikov, "Zynga of Russia That Doesn't Want to Be," Bloomberg, November 28, 2012.

Companies Have Had to Localize Data Servers to Comply with Policies

Several countries require companies to store or maintain data on local servers, either explicitly or implicitly.[10] Explicit policies state that companies must keep data within the country where the data was collected. Implicit policies compel companies to store data on local servers by requiring, for example, that data be available for regulators to review, which effectively means that the data must be stored in-country. Both types of policies are often justified by governments as necessary to protect data privacy and/or the security of systems; however, local data requirements also may "serve as thinly veiled protectionism."[11]

An example of a law that explicitly requires the local storage of data is Greek Law No. 3917/2011, Article 6, which implements the requirements of the EU's Data Retention Directive.[12] The EU directive requires Internet and telecommunications service providers to retain certain data about a subscriber, largely about their communications by phone and over the Internet.[13] However, the Greek law goes farther by also requiring that the retained data on "traffic and location" stay "within the premises of the Hellenic territory."[14] The European Commission is "aware that the law imposes restrictions on electronic communications service providers regarding the geographic location of data generation and storage, which has an economic effect on these providers and limits their freedom to organise their business," and has stated that it will take appropriate action if deemed necessary.[15]

Data localization requirements that governments justify on data privacy grounds reportedly are found in many countries.[16] For example, two Canadian provinces, British Columbia and Nova Scotia, have laws requiring that health records be stored in Canada and not moved to any other jurisdiction.[17] The provinces passed the laws in response to the perception that the USA PATRIOT Act would allow the U.S. government to access personal data about Canadian citizens.[18] Similarly, Australia's Personally Controlled Electronic Health Records Act of 2012 prohibits the overseas storage of any Australian electronic health records, without regard to actual risks or safeguards of data storage.[19]

Laws or policies that implicitly require the localization of data servers for the security of financial information or systems infrastructure can be challenging to identify because

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[10] USITC, hearing transcript, March 7, 2013, 25, 38, 70, 157, 161, 186, 216, 232, 318 (testimony of Stephen Ezell, Information Technology & Innovation Foundation; of Joshua Meltzer, Brookings; of Jake Colvin, National Foreign Trade Council; of Ed Black, Computer & Communications Industry Association; and of David LeDuc, Software & Information Industry Association); ITIF, written testimony to the USITC, March 7, 2013, 1; BRT, "Promoting Economic Growth,"2012, 2–8.

[11] CCIA, written comments to USTR, May 20, 2013, 6; BRT, "Promoting Economic Growth," 2012, 7.

[12] Tsolias, "Privacy, Data Retention and Data Protection," January 9, 2013; Law 3917/2011, Official Gazette of the Hellenic Republic, 22A/2011.

[13] Electronic Freedom Foundation website, https://www.eff.org/issues/mandatory-data-retention/eu (accessed May 2, 2013).

[14] Greek Law No. 3917/2011, art. 6. A summary of the law is available in Tsolias, "Privacy, Data Retention and Data Protection," January 9, 2013.

[15] European Commission, "Written Response to Parliamentary Question," June 14, 2011.

[16] BRT, "Promoting Economic Growth," 2012, 5–6.

[17] British Columbia, Freedom of Information and Protection of Privacy Amendment Act, 2004.

[18] Cate, "Provincial Canadian Geographic Restrictions," 2008, 3.

[19] USITC, hearing transcript, March 7, 2013, 27 (testimony of Stephen Ezell, Information Technology and Innovation Foundation); BRT, "Promoting Economic Growth," 2012, 5; USTR, *2013 National Trade Estimate*, 2013, 31.

localization requirements may arise only in practice, as companies seek to comply with other requirements. In the financial sector, for example, data may have to be stored locally to comply with government requirements related to regulatory supervision and ensuring continuity of operations.[20] Thus, Venezuela and Argentina limit offshore data processing, and China allows offshore data processing only for a bank's corporate customers. [21] Indonesia's National Bank requires that banks obtain its approval before any cross-border personal data transfers may occur.[22]

Industry participants have focused on the harms caused by such measures. The rules can constrain foreign digital companies' ability to choose where and how to store data; prevent companies from operating in the market; force local data storage; or require the restructuring of operations to comply with data requirements. [23] However, determining whether the measure is intended to disfavor foreign firms or achieve prudential policy outcomes can be challenging. In some cases, governments offer prudential reasons for their rules, but do not narrowly tailor them to address the concern. For example, the Australian and Canadian rules on health records described above apply a blanket requirement that certain personal data be stored in-country. By contrast, the United States, which also provides strong rules for the treatment of "protected health information" under the Health Insurance Portability and Accountability Act of 1996 (HIPAA), allows cross-border transfer if administrative, physical, and technical safeguards are provided.[24] Thus, the U.S. law addresses prudential concerns through a risk-based approach, while the Canadian and Australian measures apply a location-based approach. As noted by industry participants, while the objectives of these measures may be driven by prudential policy concerns, the means by which they are obtained must also be carefully considered to avoid forcing the use of local data servers.[25]

Certain Local-Content Policies Extend to Digital Industries

In some cases, governments have expressly required that companies use a specified percentage or quota of local digital inputs or include digital content from the country implementing the law. Nigeria's Local Content Development Act of 2010 provides an example (box 5.2) of a broad measure that covers many sectors, including digital products and services. As previously discussed, these measures may constrain companies' supply chain choices, drive sub-optimal business decisions, or limit markets.

Security-related measures also can favor local industries or set thresholds for use of local content. For example, China's Multi-Level Protection Scheme (MLPS) applies to banking, energy, telecommunications, education, and transportation. [26] The MLPS ostensibly aims to protect data in networks related to sensitive infrastructure, assigning all software information systems a value based on their importance to "national security,

[20] Citi, written submission to the USITC, March 14, 2013, 2.
[21] Ibid.
[22] This requirement is contained in Regulation No. 7/15/PBI/2007 on the Implementation of Risk Management in the Utilization of Information Technology. DLA Piper, "Data Protection Laws of the World," March 2012, 108.
[23] BRT, "Promoting Economic Growth," 2012, 7.
[24] U.S. Department of Health and Human Services website, HIPAA, The Security Rule, http://www.hhs.gov/ocr/privacy/hipaa/administrative/securityrule/index.html (accessed May 2, 2013).
[25] BRT, "Promoting Economic Growth," 2012, 7.
[26] USITC, *China: Effects of Intellectual Property Infringement*, May 2011, 5-30.

BOX 5.2 Nigeria's Local Content Development Act of 2010: Impact on digital products and services

Nigeria's Oil and Gas Sector Local Content Development Act of 2010 (the Act) imposes a localization requirement by mandating the use of Nigerian companies in a range of services sectors, including many services that are provided digitally. The Act, which builds upon previous localization efforts, establishes a Nigerian Content Development and Monitoring Board to enforce requirements for Nigerian content, defined as a specific percentage of total funds spent, labor hours, or input volume, for any operator in the oil and gas sector.

For digitally traded services, the Act specifies that 50 percent of the amount spent on IT management consultancy services must be local. The same is true for data management services, while the figure rises to 60 percent for data and message transmitting services and to 100 percent for general banking, auditing, and life insurance services. These are all digital or digitally enabled services.

The oil and gas sector is the primary contributor to Nigeria's gross domestic product, so the Act has had a large impact on the country's other business sectors, including suppliers of digital and digitally enabled services. The Board has granted exemptions to the requirements, and is reported to have missed previous targets because Nigeria cannot yet produce enough local products and services to fill the quotas. However, the government recently has reaffirmed its intent to enforce the requirements.

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Sources: Nigerian Content Development and Monitoring Board website, http://www.ncdmb.gov.ng/ (accessed June 4, 2013); Amanze-Nwachuku, "Nigerian Content and Indigenous Participation," September 14, 2010; Onwuemenyi, "Nigerian Content: Measuring the Gains," May 1, 2012; *Vanguard News*, "Local Content Policy Has Created 30,000 Jobs," January 22, 2013.

social order and economic interests." [27] Any system assigned a value of three or higher (out of five possible levels) must be provided by a Chinese company, owned by Chinese citizens, and use core technology based on Chinese intellectual property. [28] This requirement will exclude U.S. and foreign companies from providing digital services to large portions of the Chinese market, if (as reported) systems routinely are assigned a value of three or higher.[29]

Audiovisual quotas provide another example of explicit local-content mandates that can reach digital products and services. Current laws in many countries place limits on the number of foreign films that can enter the market, or cap the percent of time that radio or television stations can play foreign content, or set a minimum play time for domestically produced content. [30] As people consume more media online, these local-content requirements reportedly are expanding into the trade of digital products, such as movies, music, and e-books, to the detriment of U.S. companies selling their content in foreign markets.[31]

For example, the EU's 2007 Audiovisual Media Services (AVMS) Directive has expanded the scope of previous directives requiring preferences for European content to also reach on-demand or streaming video services.[32] Although the AVMS Directive does not set quotas for on-demand services, it does require member states to encourage

[27] BSA, "Lockout," June 2012, 9.

[28] USITC, *China: Effects of Intellectual Property Infringement*, 5-30.

[29] At the 23rd U.S.-China Joint Commission on Commerce and Trade (JCCT) meeting in December 2012, the Chinese government committed to revise the MLPS to address industry concerns. USTR, *2013 Report on Technical Barriers to Trade*, 2013, 54; USTR, "Fact Sheet: 23rd U.S.-China Joint Commission on Commerce and Trade," 2012.

[30] USTR, *2013 National Trade Estimate Report*, 2013. See examples from Australia, Brazil, Canada, China, EU (France, Italy, Poland, Spain), Korea, Malaysia, Sri Lanka, and Venezuela, among others.

[31] MPAA, USTR written comments, October 2012, 2.

[32] Ibid., 42.

production of and access to European works.[33] Different member states take different approaches to this mandate. For example, the Czech Republic, Spain, Italy, and Austria require on-demand services to maintain a quota of European works in their on-demand libraries, while Wallonia (in Belgium), the Czech Republic, Italy, and Spain require on-demand services to contribute to the financing of European audiovisual works.[34] The effects of the expansion of the AVMS Directive to new technologies and delivery systems remain unclear; the European Commission solicited comments from April to August 2013 on the EU's future regulation of audiovisual content.[35]

The promotion of local content in digitally delivered services is not limited to Europe. The Chinese Ministry of Culture reportedly has classified online games as "cultural products" and has supported the domestic industry so effectively that today Chinese games account for an estimated two-thirds of the domestic market, an increase from 30 percent in 2003.[36] The Australian government has reserved the right under the U.S.-Australia FTA to impose content quotas to Internet-based services.[37] The expansion of local content rules to the digital sector threatens to increase costs or limit access for foreign companies.

Some Government Procurement Rules Favor Locally Based Digital Services or Providers

Some trading partners are using public procurement to support their local digital companies. The WTO's plurilateral Government Procurement Agreement (GPA) is focused on disciplining and maintaining an open market for public procurement.[38] In the evolving digital sector, however, governments reportedly are using a variety of justifications to limit public procurement to local companies. For example, Brazil, which is not a signatory to the GPA, enacted law 12.349/2010 to allow restriction of procurement for strategic ICT goods and services to those developed domestically.[39] This requirement is further bolstered by Brazil's "Bigger IT Plan," which includes a price preference in procurement for software products certified as locally developed.[40] Government procurement rules are often combined with other practices that create localization barriers to trade—for instance, in China, where the government employs a wide range of "indigenous innovation" tools (box 5.3).

[33] See Directive 2010/13/EU of the European Parliament and of the Council of 10 March 2010 on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the provision of audiovisual media services (Audiovisual Media Services Directive), art. 13.

[34] European Commission, "Final Report on the Application of Articles 13, 16 and 17 of Directive 2010/13/EU," August 24, 2012, 5.

[35] European Commission, "Green Paper: Preparing for a Fully Converged Audiovisual World," 2013.

[36] China's censorship regime also has contributed to the dominance of domestic firms, as discussed in the section on censorship measures. *Economist*, "Special Report," April 6, 2013, 10.

[37] MPAA, USTR written comments, October 2012, 16; Australian Government, Department of Foreign Affairs and Trade website, http://www.dfat.gov.au/fta/ausfta/outcomes/01_overview.html (accessed April 30, 2013).

[38] WTO website, "Government Procurement," http://www.wto.org/english/tratop_e/gproc_e/gproc_e.htm (accessed May 4, 2013).

[39] Chaves, "Innovation Financing in Brazil," May 30, 2012, 2.

[40] BSA, "Lockout," June 2012, 5; BSA, written testimony to the USITC, February 28, 2013, 6.

BOX 5.3 Localization barriers to digital trade and indigenous innovation

Unique technical standards, public procurement limitations, and state support all reportedly have been used to support domestic or "indigenous innovation" in China. These same measures may also operate as localization barriers to digital trade, in China and elsewhere.

For example, industry participants are concerned that China's practice of developing technical standards that are unique to China rather than adopting global standards, as well as the limitations it has placed on the participation of foreign companies in standards development, will be extended to cloud computing. In recent years, China has introduced a number of unique technical standards applicable to ICT products purchased in China, including efforts to develop a unique encryption standard called WAPI, a UHT/EUHT standard for wireless networks, and a mobile communication TD-SCDMA standard. There are indications that the use of unique standards is expanding to reach software and cloud-based systems. For instance, China's National Information Security Standards Technical Committee recently issued a document establishing domestic cloud computing standards: "Information Security Technology: Government Department Cloud Computing Service Provider Basic Security Requirements."

Another means by which China may be localizing digital products and services is by supporting companies located in China. According to the Information Technology and Innovation Foundation (ITIF), the Chinese government "offers tax-breaks and low-cost office space to cloud computing companies that locate in Beijing." The Chinese government has also launched a project, National Cloud Computing Pilot Cities, which offers procurement preferences to Chinese applicants for grants. The American Chamber of Commerce in China (Am-Cham China) reports that the Chinese government has granted billions of yuan to Chinese-based cloud computing projects. The Chinese government has not provided clear information about how foreign companies can participate in these projects, though it committed at a recent JCCT meeting to provide "fair and equitable access."

Such measures are not restricted to China. USTR's *Technical Barriers to Trade* and *National Trade Estimate* reports identify other countries that use government procurement preferences, standards manipulation, and state support, among other measures, to bolster domestic companies. The French government reportedly is providing state support to national digital companies, and the South African government passed the Electronic Communications and Transactions Law, which poses regulatory burdens on digital trade. India's government passed a rule that requires government agencies to offer Preferential Market Access (PMA) for ICT goods that include a certain percentage of Indian content, though this rule applies only to physical products.

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Sources: USITC, *China: Effects of Intellectual Property Infringement*, May 2011; Breznitz and Murphee, *The Rise of China in Technology Standards,* January 16, 2013; USTR, *Report on Technical Barriers to Trade*, 2013; Castro (ITIF), Statement to the House Judiciary Intellectual Property, Competition and the Internet Subcommittee, July 25, 2012; USTR, *2013 National Trade Estimate Report on Foreign Trade Barriers*, 2013, 161, 334; Am-Cham China, "2013 White Paper," 2013, 266–70.

Data Privacy and Protection-Related Measures

Companies in all industries must comply with privacy and data protection laws generally intended to protect individuals' personal information.[41] Compliance can be difficult because countries often do not apply the same legal framework to data protection and because data rarely stays in one location. Instead, online transactions may instantaneously transmit information around the world. Under these circumstances, determining which country's laws govern particular transactions, and what legal requirements must be met, can be extremely difficult (box 5.4).

[41] The United States generally uses the term "data privacy" on the assumption that only private information can be protected. By contrast, Europe refers to the broader term "data protection," which may extend to information that is in the public domain. U.S. government official, interview by USITC staff, Washington, DC, March 19, 2013.

BOX 5.4 Privacy in the cloud: What laws apply?

Differences in data privacy laws across countries are often of major significance to cloud computing companies because the cloud is distributive in nature: data is collected, stored, used, processed, and duplicated in multiple places, often at the same time. For example, as Flaherty and Ruscio have explained:

> [A] Cloud Provider in the United States can be dealing with personal information of users in Canada and Australia, while utilizing data processors in India, who access the data on servers located in Uruguay, all of which is backed up on servers located in Ireland.

Moreover, as Microsoft has noted, countries often make unpredictable assertions of jurisdiction with regard to cloud computing. Some take the view that only the country in which the data is stored has jurisdiction; others assert jurisdiction so long as the service is offered there or a user associated with the data resides there; still others base jurisdiction on the service provider's place of business, regardless of where the data or users are located.

Similarly, the Entertainment Software Association (ESA) has noted legal compliance challenges facing operators of cloud computing services in the video game industry. Different jurisdictions often impose different legal standards for law enforcement access, data retention, data security, censorship, and other requirements. For example, a company that complies with a law enforcement request from one country may risk violating the privacy laws of another country that also asserts jurisdiction over the data, putting the firm into a legal Catch-22. This unpredictability can depress interest in cloud computing and other innovations, and substantially limit the ability of cloud computing companies and their customers to do business in multiple markets.

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Source: Flaherty and Ruscio, "Stormy Weather," 2012, 3–4; Microsoft, written comments to the U.S. Department of Commerce (USDOC), December 6, 2010, 3; ESA, written comments to the USDOC, December 6, 2010, 3.

Countries Take Divergent Approaches to Data Privacy and Protection

A key distinction among privacy regimes is whether the country has an omnibus law that applies across sectors or whether requirements vary by sector. The EU provides the primary example of the omnibus approach. By contrast, in the United States and other countries, different laws govern data protection in particular industries (table 5.2).[42] Because the U.S.-EU economic relationship is the world's largest,[43] this difference in approach can create substantial difficulties for firms.

Under the U.S. sectoral approach to privacy protection, the Gramm-Leach-Bliley Act[44] regulates how financial institutions collect, disclose, share, and protect personally identifiable financial information; the Health Insurance Portability and Accountability Act (HIPAA)[45] regulates the use and disclosure of protected health information; and the Children's Online Privacy Protection Act of 1998[46] regulates online collection and use of the personally identifiable information of children.[47] An additional important

[42] The section on localization barriers to trade includes a discussion of particular requirements that different countries apply to health records.

[43] The U.S.-EU relationship accounts for approximately one–third of total goods and services trade and nearly half of global economic output. USTR website, http://www.ustr.gov/countries-regions/europe-middle-east/europe/european-union (accessed May 30, 2013). See also chapter 4.

[44] Pub. L. No. 106-102, 113 Stat. 1338 (1999) (codified at 15. U.S.C. §§ 6801–6809).

[45] Pub. L. No. 104-191, 110 Stat. 1936 (1996) (codified as amended in scattered sections of 42 U.S.C. and 29 U.S.C.)

[46] Pub. L. No. 105-277, 112 Stat. 2681-728 (1998) (codified at 15 U.S.C. §§ 6501–6506).

[47] Wolf, written testimony to the USITC, March 7, 2013, 2.

TABLE 5.2 Diverse approaches to privacy, data protection, and breach notification

Subject matter	Country	Source
Sectoral approach to privacy/data protection	Brazil, Dubai, Greenland, India, Singapore, Thailand, the United States, and Zimbabwe	BSA
Recognized by the EU as having adequate data protection	Andorra, Argentina, Canada, the EU, Guernsey, Israel, Jersey, New Zealand, Switzerland, the Faroe Islands, the Isle of Man, and Uruguay	BSA, USTR
Privacy/data protection laws considered generally compatible with the APEC Privacy Framework	Argentina, Australia, Canada, the EU, Japan, Korea, Malaysia, Mexico, Russia, Singapore, and the United States	BSA, FTC
Mandatory reporting of data breaches	Austria, Germany, Norway, Spain, Mexico, the United Arab Emirates, the United States (46 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands)	Nymity, Bevitt, BSA

Sources: BSA, "Global Cloud Computing Scorecard," 2013; USTR, *National Trade Estimate*, 2013; Nymity, "Sectoral and Omnibus Privacy and Data Protection Laws," 2012; Bevitt et al., "Dealing with Data Breaches," 2012; and FTC, "FTC Becomes First Enforcement Authority," July 26, 2012.

characteristic of U.S. privacy law is the targeted enforcement of privacy requirements by the Federal Trade Commission (FTC), the Department of Health and Human Services, and other federal and state regulators.[48] In fact, based on the activist role of privacy regulators, and other aspects of the U.S. system, researchers have found a strong regime of "privacy on the ground" in the United States, notwithstanding the lack of an omnibus law.[49]

By contrast, the EU has a regionwide Data Protection Directive, with national implementing laws in all EU jurisdictions.[50] It allows the transmission of EU personal data to third countries only if the country is deemed to provide an adequate level of protection by reason of domestic law or international commitments.[51] The European Commission has found that only a handful of non-EU countries have adequate protections (table 5.2).[52]

Moreover, although the EU has a regionwide directive, each member state enacts its own implementing laws. These laws can vary greatly, creating inconsistency and unpredictability for firms seeking to transfer data within the EU and on to third countries.[53] Industry representatives state that addressing the "fragmentation, inconsistency, redundancy and procedural complexity" caused by different national data

[48] For example, the Attorney General of California and Amazon, Apple, Google, Hewlett-Packard, Microsoft, and Research in Motion recently reached a voluntary agreement that establishes a set of standards to improve privacy protections in mobile applications. Harris, "Privacy on the Go," January 2013, 4; see also FTC, "FTC Staff Comments," January 2011, 2, and Digital Trade Coalition, written comments to USTR, May 10, 2013, 3.

[49] "Privacy on the ground" means how corporations actually manage privacy and what motivates them. Bamberger and Mulligan, "Privacy on the Books and on the Ground," 2011, 247; Wolf and Maxwell, "So Close, Yet So Far Apart," Summer 2012, 9.

[50] Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the Protection of Individuals with regard to the Processing of Personal Data and on the Free Movement of Such Data.

[51] Wolf and Maxwell, "So Close, Yet So Far Apart," Summer 2012, 9.

[52] European Commission, "Decisions on the Adequacy of Protection of Personal Data," n.d. (accessed May 6, 2013).

[53] Wolf, written testimony to the USITC, March 7, 2013, 3; U.S. government officials, interview by USITC staff, Washington, DC, March 19, 2013; industry representatives, interviews by USITC staff, San Francisco, CA, April 16, 2013.

protection requirements within the EU should be a priority of the of the Transatlantic Trade and Investment Partnership (TTIP) negotiations.[54]

Another comprehensive approach to privacy regulation is found in the Asia-Pacific Economic Cooperation (APEC) Privacy Framework, endorsed by APEC members in 2004.[55] The framework includes nine high-level principles governing the collection, use, and handling of personally identifiable information.[56] According to the USDOC's Internet Policy Task Force, it is a useful model for groups of countries with common values but sometimes divergent policy frameworks.[57] Countries identified as having privacy regimes that are generally compatible with the APEC framework are listed in table 5.2.

Witnesses at the Commission's hearing stressed the importance of achieving "interoperability" among countries' varying privacy regimes.[58] In contrast to harmonization, interoperability assumes that while there are different privacy approaches, the outcomes generally will be similar and thus should be entitled to mutual recognition.[59] More specifically, privacy interoperability requires that organizations take on binding obligations to protect private information based on established criteria; that there are mechanisms to enforce these obligations; and that regulatory agencies can depend on each other to ensure that these obligations are honored when data travels around the world.[60]

Without this mutual recognition, there is the potential to cause substantial damage to consumer trust in the Internet; to erode business opportunities for data-related innovations, for example, in the areas of analytics and Big Data; and to raise costs for businesses complying with multiple divergent standards.[61] Moreover, unnecessary regulatory complexity often favors large incumbent firms over new entrants and small firms. SMEs have reported that they do not have the regulatory expertise and resources

[54] Digital Trade Coalition, written comments to USTR, May 10, 2013, 7; The Internet Association, written comments to USTR, May 10, 2013, 8.

[55] APEC has 21 member economies: Australia, Brunei, Canada, Chile, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Taiwan, Thailand, the United States, and Vietnam.

[56] These principles are as follows: preventing harm, notice, use collection limitation, choice, security safeguards, integrity, access and correction, and accountability. Harris, "The APEC Cross Border Privacy Rules System," March 2013.

[57] The USDOC's Office of the Secretary, with the assistance of the National Telecommunications and Information Administration, the Patent and Trademark Office, the National Institute of Standards and Technology, and the International Trade Administration, has created an Internet Policy Task Force to conduct a comprehensive review of the nexus between privacy policy, copyright, global free flow of information, cybersecurity, and innovation in the Internet economy. USDOC, Internet Policy Task Force, "Commercial Data Privacy," 2010, 55–56. Updates on the work of the task force are published on its website http://www.ntia.doc.gov/category/internet-policy-task-force.

[58] As noted in the Citi submission: "[a] primary goal of any regulatory scheme concerning cross border data processing should be the establishment of global interoperability of national legal and regulatory requirements." Citi, written submission to the USITC, March 14, 2013, 6.

[59] USITC, hearing transcript, March 7, 2013, 138 (testimony of Edward Gresser, Globalworks Foundation); USITC, hearing transcript, March 7, 2013, 109–10 (testimony of Joshua Meltzer, Brookings Institution). Harmonization efforts aim for a higher level of similarity among regulatory approaches.

[60] USITC, hearing transcript, March 7, 2013, 60, 107–8 (testimony of Martin Abrams, Centre for Information Policy and Leadership).

[61] USITC, hearing transcript, March 7, 2013, 60, 107–8 (testimony of Martin Abrams, Centre for Information Policy and Leadership); industry representatives, interviews by USITC staff, April 16, 2013, San Francisco, CA; industry representatives, interviews by USITC staff, April 18, 2013, Redwood City, CA.

necessary to navigate the complex privacy landscape, noting particular problems with nontransparent and subjective privacy rules at the EU member state level. [62]

Interoperability Challenges: The U.S. and EU Systems

Interoperability is also more likely to be obtainable than harmonization because of the different cultural and legal starting points on privacy across countries.[63] In the United States, for example, the use of personal information is generally permitted unless a law prohibits it; this is due in part to strong protections for freedom of expression and commerce.[64] By contrast, the EU generally prohibits the collection and processing of personal data unless a law explicitly permits it.[65]

The EU does not consider the U.S. data protection framework adequate, mainly because it is based on sector-specific legislation and self-regulation rather than an omnibus law.[66] To enable continued data flows between these two major trading partners, the EU has approved a Safe Harbor provision, which requires eligible U.S. firms to certify compliance with various EU data-handling requirements (box 5.5).[67]

Although the Safe Harbor Framework is seen as providing a valuable mechanism for data transfer between the EU and United States, firms reportedly face ongoing problems navigating the broader EU privacy landscape:

- Different EU member states implement the EU Data Protection Directive differently, causing uncertainty and increasing costs for U.S. and EU firms. The European Commission has estimated that this variation costs European firms an estimated 2.3 billion euros (approximately $3 billion) each year.[68] A comparable estimate is not available for the burden on U.S. firms, although anecdotal evidence suggests that the EU's privacy regime, and particularly nontransparent differences across member states, impose substantial costs, especially on SMEs.[69] The EU has recognized that there is a need to update its Data Protection Directive to provide a regionwide regulation applicable in the same way in each member state and address other shortcomings.[70]

[62] Industry representatives, interviews by USITC staff, April 16, 2013, San Francisco, CA; industry representatives, interviews by USITC staff, April 18, 2013, Redwood City, CA.

[63] Notwithstanding divergent starting points, both the U.S. and the EU approaches are grounded in the Fair Information Practice Principles, which form the core of the 1980 OECD privacy guidelines and focus on empowering people to control their personal information as well as ensuring adequate data security. USITC, hearing transcript, March 7, 2013, 61 (testimony of Martin Abrams, Center for Information Policy Leadership).

[64] USITC, hearing transcript, March 7, 2013, 60 (testimony of Martin Abrams, Center for Information Policy Leadership); Wolf and Maxwell, "So Close, Yet So Far Apart," Summer 2012, 8.

[65] The EU approach is predicated on the idea that privacy is a fundamental human right; thus the collection and processing of all personal data should be regulated. Wolf and Maxwell, "So Close, Yet So Far Apart," Summer 2012, 9.

[66] Wolf and Maxwell, "So Close, Yet So Far Apart," Summer 2012, 10.

[67] For their part, EU firms may be subject to the regulatory jurisdiction of the FTC and other enforcement authorities with regard to their handling of U.S. personal data.

[68] European Commission, "How Will the EU's Data Protection Reform," 2012.

[69] Industry representatives, interviews by USITC staff, April 16, 2013, San Francisco, CA; industry representatives, interviews by USITC staff, April 18, 2013, Redwood City, CA; Digital Trade Coalition, written comments to the USTR, May 10, 2013.

[70] Wolf and Maxwell, "So Close, Yet So Far Apart," 2012, 10; Microsoft, written comments to the USDOC, December 6, 2010, 3.

BOX 5.5 Elements of the U.S.-EU Safe Harbor provisions and data protection requirements

The U.S.-EU Safe Harbor Framework went into effect in 2000. It is a voluntary framework, administered by the USDOC's International Trade Administration. General elements include these:

- To join the Safe Harbor, U.S. firms must undertake to comply with specific privacy principles in the areas of notice, choice, onward transfer, data integrity, security, access, and enforcement.
- Compliance with the Safe Harbor framework enables the transfer of personal data from the EU to the United States across industrial sectors. Exceptions include financial institutions and telecommunications common carriers, which are governed by different rules.
- Over 3,700 U.S. companies have self-certified to the Safe Harbor Framework requirements since its implementation (not all of these certifications remain current). More than 70 percent of these companies are SMEs.

Other approaches for compliance with EU Data Protection requirements include:

- "Model Contracts," which are standard contractual clauses that EU authorities approve and must be included in agreements that involve the transfer of personal data outside the EU; and
- "Binding Corporate Rules (BCRs)," which are a set of policies that apply to intra-company transfers of data worldwide, and not just to the United States.
    - The review and approval process for BCRs has proven to be time-consuming and costly. To date, fewer than 50 companies have had BCRs approved by the relevant authorities across EU member states.
    - Given the substantial compliance costs, large multinational companies generally are the only ones that have availed themselves of BCRs.

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Sources: Wolf, written testimony to the USITC, March 7, 2013, 3; USDOC, Office of Technology and Electronic Commerce, "Comparing the U.S.-EU Safe Harbor Framework," March 7, 2013; Lamb-Hale, written testimony to the House Energy and Commerce Subcommittee, September 15, 2011.

- U.S. companies involved in cloud computing and social networking have faced particular challenges with regard to their business models and privacy practices, often as a result of different requirements and interpretations across EU member states.

    - For example, the USDOC recently had to issue "clarifications" on how the Safe Harbor Framework should be applied to cloud computing service providers to rebut more stringent interpretations being articulated by data protection authorities in EU member states.[71]

    - Social network providers reportedly are classified as data controllers under the EU Data Protection Directive, making them subject to obligations that potentially conflict with their basic business models.[72] For example, data controllers are required to minimize their collection of data to a level that is "adequate, relevant, and not excessive."[73] However, social networking platforms focus on collecting the most data possible from users to create rich and highly accurate profiles that facilitate information sharing among users, thereby enhancing the value of the platform.[74] Tensions between the Directive's requirements and the social

[71] USDOC, "Clarifications Regarding the U.S.-EU Safe Harbor Framework," April 2013.
[72] Martinez and Pardillo, "Impact of Privacy Regulation," 2012, 135.
[73] Ibid.
[74] See chapter 2 for a discussion of social networking websites.

networking business model have spurred EU efforts to revise and update its regulatory framework.[75]

New Approaches to Privacy and Data Protection in the United States and Europe

Both the United States and the EU have proposed fundamental changes to their privacy and data protection regimes. The Obama Administration has proposed a new privacy framework, which includes a Consumer Privacy Bill of Rights and the development of enforceable industry codes of conduct through a multi-stakeholder process led by the USDOC. The proposal also includes a commitment to interoperability between different countries' privacy regimes through mutual recognition of different frameworks.[76] Government and industry privacy experts who support enactment of a baseline U.S. privacy law state that that it would foster the free flow of data by clarifying the ground rules and increasing interoperability at the international level, where the EU framework has held sway in the absence of a U.S. omnibus law.[77]

For its part, the European Commission has proposed a new privacy framework that would replace the 1995 directive. The U.S. and EU proposals are similar in their focus on "privacy by design," meaning that privacy considerations should be built into every stage of product development and that those who collect and use personal data should be held accountable and obtain informed consent.[78] Language in the EU proposal that provides for a "one-stop shop" for data protection, and that brings more interoperability across member states, also has been favorably reviewed by U.S. firms.[79]

The proposals differ substantially, however, in their approach to enforcement. The United States places continued importance on voluntary and flexible codes of conduct, subject to enforcement by regulators. By contrast, the EU proposal contains broad new consumer rights—the right to have data deleted (the "right to be forgotten") and to move data from one service to another ("data portability")—that are not part of existing or proposed U.S. laws.[80] Industry representatives have noted problems with these proposals; for example, the right to be forgotten reportedly is inconsistent with the data backup and synchronization services that cloud computing providers guarantee to their customers.[81]

The EU proposal is also more stringent in the area of data breach notification. The laws of 46 U.S. states, as well as the laws of several countries, reportedly mandate notification in the event of a data breach (table 5.2). However, the EU proposal would impose fines of up to 2 percent of a firm's annual global revenue—an amount that many stakeholders consider to be unreasonable, given the uncertainty and discretion surrounding the draft

[75] Martinez and Pardillo, "Impact of Privacy Regulation," 138, 2012.

[76] White House, "Consumer Data Privacy," 2012, 31; Wolf and Maxwell, "So Close, Yet So Far Apart," 2012, 11.

[77] Kerry, statement to the U.S. Senate Committee on Commerce, Science, and Transportation, June 29, 2011, 3–5; Torres, "The New Frontier," February 22, 2013; U.S. government official, interview by USITC staff, Washington, DC, March 19, 2013. However, within the framework of the TTIP negotiations, some industry representatives highlight the strength of the existing U.S. regime and state that there should be no presumption of substantial changes in U.S. or EU law. The Internet Association, written comments to the USTR, May 10, 2013, 7; Digital Trade Coalition, written comments to the USTR, May 10, 2013, 10–11.

[78] Wolf and Maxwell, "So Close, Yet So Far Apart," 2012, 11.

[79] Allan, "Facebook Views on Privacy," 2013, 143; Digital Trade Coalition, written comments to the USTR, May 10, 2013, 7–8; The Internet Association, written comments to the USTR, May 10, 2013, 8.

[80] Allan, "Facebook Views on Privacy," 2013, 143.

[81] Industry representative, interview by USITC staff, San Francisco, CA, April 16, 2013.

law's provisions.[82] There remain substantial differences in the latest privacy proposals in the EU and United States.

IPR-Related Measures

The Internet facilitates access to large amounts of content that would otherwise be difficult, if not impossible, to access, contributing to innovation and creativity. On the other hand, it also creates opportunities for significant intellectual property theft and infringement.[83] Digital content representatives who testified at the Commission's hearing identified Internet piracy as the most damaging barrier to digital trade in their industry. By contrast, Internet intermediaries focused on the chilling effect that overly broad or unpredictable legal obligations can have on their ability to deliver valuable services. Digital content representatives also have recognized the importance of clearly defined liability guidelines. An ongoing challenge for governments is facilitating a balance between IPR protection and online commerce and innovation, in an era of rapidly changing technologies and business models.

Digital Content Representatives Identify Piracy as the Single Most Damaging Trade Barrier

Innovative software and digital content companies that rely on copyright, trademark, patent, and trade secret protections report that effective IPR protection and enforcement are critical to their economic success and growth.[84] Conversely, IPR infringement or piracy is identified as the "single-most damaging barrier and impediment to digital trade" because it "undercuts legitimate services, harms investors in content production, and cheats law-abiding consumers."[85] Specific examples were provided at the Commission's hearing (box 5.6).

Determining the size and scope of Internet-enabled IPR infringement is extremely challenging; infringing files are traded online, and websites offering counterfeits are launched and accessed, countless times each day. As a result, estimates of online infringing activity often represent only a small snapshot of the total, although even the snapshots suggest extremely large volumes of IPR-infringing content online.[86] For example, an analysis of Internet traffic commissioned by NBC Universal found that approximately 99 percent of BitTorrent traffic on peer-to-peer (P2P) networks is

[82] Rand, "Privacy and Data Protection," 2013, 66; Wolf, written testimony to the USITC, March 7, 2013, 4; Digital Trade Coalition, written comments to the USTR, May 10, 2013, 12–13.

[83] For example, the White House has noted that U.S. companies, law firms, academia, and financial institutions are increasingly experiencing cyber-intrusion activity against electronic repositories containing valuable trade secrets and other data. White House, "Administration Strategy on Mitigating the Theft," February 2013, 1; Meltzer, "The Internet, Cross-Border Data Flows," 2013, 8. The following sources contain a more extensive discussion of cybercrime and cybersecurity issues: Verizon, "Data Breach Investigations Report," 2013; Mandiant, "APT1: Exposing One of China's Cyber Espionage Units," 2013; Norton, "2012 Norton Cybercrime Report," 2012.

[84] LeDuc, written testimony submitted to the USITC, March 14, 2013, 4.

[85] IIPA represents the publishing, business software, entertainment software, independent film and television, motion picture, music publishing, and recording industry associations. IIPA, written submission to the USITC, February 28, 2013, 7; RIAA, written submission to the USITC, February 28, 2013,7; MPAA, written submission to the USITC, March 15, 2013 ("The most immediate, most pernicious impediment and threat to the digital offerings of audio-visual content is the theft of that content").

[86] USITC, *China: Effects of Intellectual Property Infringement* May 2011, 2-13 to 2-14.

BOX 5.6 IPR infringement-related barriers to digital trade

Representatives of the music, publishing, software, and movie industries reported the following IPR infringement-related barriers to digital trade:

Foreign web sites that facilitate infringement

- RIAA categorizes different types of infringing sites as follows:
  - **Hubs** that enable users to upload content to "lockers" accessible to others, including Rapidgator, Turbobit, DepositFiles, and PutLocker;
  - **P2P networks** such as The Pirate Bay;
  - **Infringement directories** that are dedicated to increasing access to infringing content;
  - **Search applications** that enable users to search for content and then link to sites where it can be illegally obtained; and
  - **Streaming sites** that provide on-demand and unauthorized access to copyrighted materials.

- Book and journal publishers report taking action against foreign sites offering an "Internet library" of more than 400,000 unauthorized copies of e-books in 2012. The sites made the e-books available for free downloading, reportedly earning more than $10 million annually for the sites' operators in Ireland from advertising, subscriptions, and donations.

- The entertainment software industry reports two emerging problems in particular: the online theft of "digital entitlements," such as game keys and virtual currencies, and the establishment of unauthorized servers that use the publishers' digital assets to host unauthorized game play.

- Songwriters and music publishers, who are overwhelmingly small businesses, report that the inability to take down infringing online content on foreign sites substantially undermines their ability to collect royalties.

- The movie industry reports that one of the leading sources of infringing copies of audiovisual works online is their illegal recording in theatres.

End-user software piracy

- This type of business software piracy includes the installation of software on multiple computers beyond the terms of a license, as well as client-server overuse, in which more than the authorized number of employees have access to a program. The software may be obtained from online or offline sources.

Unauthorized software installation onto PCs, mobile devices, and media boxes

- Manufacturers and dealers reportedly install illegal copies of software, movies, music, television programming, and other creative materials on Internet-connected devices.

Circumvention of technological protection measures (TPMs)

- TPMs are intended to ensure that works made available in the digital and online environments are not easily stolen. However, there are reportedly entire business models built around providing devices or technologies to circumvent TPMs.

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Sources: IIPA, written submission to the USITC, February 28, 2013; BSA, written submission to the USITC, February 28, 2013; Association of American Publishers (AAP), written submission to the USITC, March 14, 2013; Entertainment Software Association (ESA), written submission to the USITC, March 7, 2013; National Music Publishers' Association, written submission to the USITC, February 28, 2013.

copyright content being shared illegally.[87] An economic consulting firm, Frontier Economics (on behalf of the Business Action to Stop Counterfeiting and Piracy), estimated the value of digitally pirated music, movies, and software (not the actual losses resulting from the infringement) at $30–$75 billion in 2010, growing to $80–$240 billion by 2015.[88]

[87] Envisional, *An Estimate of Infringing Use*, 2011, 2 (estimate excludes pornography distributed over these mechanisms). P2P networks and BitTorrent are defined in the glossary.

[88] Frontier Economics, "Estimating the Global Economic and Social Impacts," February 2011, 5; IIPA, written submission to the USITC, February 28, 2013, 8.

To promote better IPR protection on- and offline, USTR conducts an annual review of the state of trading partners' IPR protection, enforcement, and market access for persons relying on IPR.[89] Countries may be designated as Priority Foreign Countries (reserved for those with particularly egregious practices); placed on a Priority Watch List (for those that will be the focus of increased bilateral attention); or on a Watch List.[90] In 2013, USTR identified one country, Ukraine, as a Priority Foreign Country, in part because of its failure to implement effective means to combat widespread online infringement, and the lack of transparent and predictable provisions for intermediary liability (table 5.3). USTR also placed 9 other countries on its Priority Watch List for special monitoring and 18 countries on its Watch List based on substantial Internet piracy and inadequate legal frameworks to address intermediary liability for online infringement, among other IPR problems.[91] USTR also monitors Internet piracy issues in its Notorious Markets Report, identifying sites hosted in Canada, China, the Netherlands, Panama, Russia, Sweden, Switzerland, Ukraine, the United Kingdom, and Vietnam that were reportedly engaged in large-scale piracy and counterfeiting in 2012 (table 5.3).[92]

To better address online infringement, USTR also urges trading partners to accede to and fully implement the World Intellectual Property Organization (WIPO) Copyright and Performances and Phonograms Treaties (collectively, the Internet Treaties).[93] The Internet Treaties are intended to ensure that traditional means of IPR protection apply to works transmitted on the Internet. According to WIPO, they reflect a balance between the demands of countries seeking stronger IPR protections and those seeking greater protection for users and intermediaries.[94] Countries that reportedly do not have laws in place to fully implement the Internet Treaties are identified in table 5.3.

Internet Intermediaries Identify Unpredictable Legal Liability as a Digital Trade Barrier

In the United States, the Internet Treaties are implemented through the Digital Millennium Copyright Act of 1998 (DMCA), which includes the Online Copyright Infringement Liability Limitation Act.[95] The DMCA creates rules of the road for Internet intermediaries and includes a general prohibition on the circumvention of technological protection measures used by copyright owners to protect their content.[96] It also contains four "safe harbors" under which an online service provider may be exempted from copyright liability (box 5.7). The DMCA thus "fosters a balance of interests by enabling rights holders to enforce their rights against online infringers, while limiting the liability

[89] USTR, *2013 Special 301 Report*, May 1, 2013, 4.

[90] Ibid., 7.

[91] Ten countries were placed on the Priority Watch List in 2013; USTR did not identify Internet-related IPR problems in Algeria. Thirty countries were placed on the Watch List; Internet-related concerns were identified in 18 of these countries. USTR, *2013 Special 301 Report*, May 1, 2013.

[92] USTR, *Out-of-Cycle Review of Notorious Markets*, December 13, 2012, 2–6.

[93] In addition, USTR relies on multilateral engagement on IPR issues at the WTO, and the negotiation, implementation, and monitoring of IPR commitments in trade agreements to promote IPR protection worldwide. USTR website, "Intellectual Property," http://www.ustr.gov/trade-topics/intellectual-property (accessed May 23, 2013).

[94] WIPO, "The Advantages of Adherence," n.d. (accessed May 6, 2013).

[95] DMCA, 17 U.S.C. § 512 (2012).

[96] Technological protection measures can be grouped into two categories: measures that limit access to authorized users, and those that seek to control the use of the content once the user has access to it to ensure that unauthorized reproductions are not made. Common access control features include passwords, digital signatures, and cryptography. Common use control measures include serial copy management systems for audio digital taping devices and scrambling systems for DVDs that prevent unauthorized reproduction. WIPO, "How Do Technological Protection Measures Work?" n.d. (accessed May 6, 2013).

TABLE 5.3 Countries with IPR-related impediments to digital trade

Subject matter	Country	Source
Identified as a Priority Foreign Country because of egregious IPR problems	Ukraine	USTR (2013)
Identified on the Priority Watch List because of substantial Internet piracy and/or gaps in intermediary liability laws	Argentina, Chile, China, India, Indonesia, Pakistan, Russia, Thailand, and Venezuela	USTR (2013)
Identified on the Watch List because of substantial Internet piracy and/or gaps in intermediary liability laws	Belarus, Bolivia, Brazil, Bulgaria, Colombia, Egypt, Greece, Israel, Italy, Kuwait, Lebanon, Mexico, Peru, Philippines, Romania, Turkey, Uzbekistan, and Vietnam	USTR (2013)
Identified as hosting Internet marketplaces engaged in substantial piracy and counterfeiting	Canada, China, Netherlands, Panama, Russia, Sweden, Switzerland, Ukraine, United Kingdom, Vietnam	USTR (2012)
Laws implementing World Intellectual Property Organization (WIPO) Internet Treaties reportedly not in force	Bolivia, Brazil, India, Israel, Kenya, Lebanon, Monaco, Namibia, New Zealand, Nigeria, South Africa, Thailand, Uzbekistan, Venezuela, Vietnam	WIPO, BSA, MPAA, USTR (2013)
Laws governing intermediary liability for copyright-infringing content reportedly not in force	Argentina, Brazil, Indonesia, Russia, Thailand, Vietnam	BSA
Laws requiring intermediaries to take down infringing content upon notice from IPR owner reportedly not in force	Brazil, Canada, India, Indonesia, Mexico, Russia, Thailand, Vietnam	BSA

Sources: USTR, *2013 Special 301 Report*, April 2013; USTR, *Notorious Markets Review*, December 2012; WIPO, "Contracting Parties," n.d. (accessed May 6, 2013); BSA, "Global Cloud Computing Scorecard," 2013; MPAA, "Trade Barriers to Exports," October 15, 2012.

BOX 5.7 DMCA safe harbor elements

The most commonly used DMCA safe harbor is for information residing on systems or networks at the direction of users. To be eligible for this safe harbor, a service provider must:

- Adopt and reasonably implement policies to address repeat infringers;
- Accommodate standard technical measures used by copyright owners to protect their works;
- Not have actual knowledge of the infringement or be aware of facts from which infringement is apparent, or upon obtaining knowledge, act expeditiously to remove the infringing material;
- Not receive a financial benefit from the activity when the service provider has the ability to control the activity, and upon notification of the infringement act expeditiously to remove it ; and
- Designate an agent to receive take-down notices from copyright owners who believe that their rights have been infringed by user-posted content.

These requirements form the basis for the "notice and takedown" regime that service providers must put in place to be eligible for immunity for IPR infringement under the DMCA.

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Source: Gellis, "Navigating the DMCA," August 2012, 326–27.

of Internet intermediaries for the infringing actions of their subscribers if they take certain steps aimed at combating infringement."[97]

U.S. law also recognizes the importance of a balanced approach in exceptions and limitations to copyright liability, as well as the Communications Decency Act (CDA). For example, section 107 of the U.S. copyright law identifies situations in which the reproduction of a copyrighted work may be permissible under the fair use doctrine, such as criticism, comment, news reporting, teaching, scholarship, and research.[98] Moreover, section 230 of the CDA generally grants immunity to Internet intermediaries for liability for content created by third parties and actions taken in good faith to restrict access to objectionable online content.[99] Together, these laws reportedly have contributed to the expansion of the U.S. digital economy by striking a balance between the removal of illegal content and the ability of Internet intermediaries to provide valuable and innovative services.[100]

By contrast, the lack of a clear and balanced legal framework to govern the respective rights and responsibilities of digital content owners and intermediaries reportedly can operate as a substantial barrier to digital trade, particularly with respect to new digital technologies.[101] Experts and industry representatives maintain that uncertainty over Internet intermediaries' legal liability creates disincentives to innovation and can close the market to small start-ups, which are often unable to afford expensive legal or compliance staffs.[102] Even larger players state that they have fewer resources available to innovate or improve upon existing business models if they must spend large amounts of money because of unclear legal frameworks.[103]

Many countries do not have DMCA-type protections or exceptions and limitations to copyright liability for intermediaries in place. For example, Argentina, Brazil, Indonesia, Russia, Thailand, and Vietnam reportedly do not have adequate laws in place to govern intermediary liability for copyright-infringing content. Similarly, Brazil, Canada, India, Indonesia, Mexico, Russia, Thailand, and Vietnam reportedly do not have adequate notice and takedown regimes to govern the removal of infringing online content upon notification by rights holders (table 5.3).

[97] USDOC, "Inquiry on Copyright Policy," October 5, 2010 (citing 17 U.S.C. § 512 (2006)); CCIA, written submission to the USITC, February 27, 2013, 8.

[98] 17 U.S.C. § 107 (2012); U.S. Copyright Office, "Fact Sheet on Fair Use," June 2012; USTR, "USTR Introduces New Copyright Exceptions and Limitations Provisions," July 3, 2012; industry representatives, interview by USITC staff, Washington, DC, April 22, 2013.

[99] 47 U.S.C. § 230 (2012); USDOC, "Inquiry on Copyright Policy," October 5, 2010; industry representative, interview by USITC staff, San Francisco, CA, April 16, 2013; AT&T Inc., written comments to the USDOC, December 2010, 4; Center for Democracy & Technology (CDT), written comments to the USDOC, December 6, 2010.

[100] CCIA, written submission to the USITC, February 27, 2013, 1, 8; industry representatives, interview by USITC staff, Washington, DC, April 22, 2013; Internet Association, written comments to the USTR, May 10, 2013, 5.

[101] BSA, "BSA Global Cloud Computing Scorecard," 2013, 6; MPAA, "Trade Barriers to Exports," October 15, 2012, 8. The MPAA stresses the need for foreign governments to have in place essential legal protections for the online environment, including notice and takedown provisions; clearly defined Internet service provider guidelines; the protection of temporary copies and or the "making available" right; and provisions against the circumvention of technological protection measures.

[102] CDT, written comments to the USDOC, December 6, 2010, 3; The Internet Association, written comments to the USTR, May 10, 2013, 2; industry representatives, interviews by USITC staff, San Francisco, CA, April 16, 2013.

[103] Industry representatives, interview by USITC staff, Washington, DC, April 22, 2013.

Moreover, even in countries with such laws on the books, U.S. companies and their executives reportedly have been subjected to civil and criminal liability based on misconduct by third parties. For example, the Italian government brought a criminal case against several Google executives for a video posted by a YouTube user that showed the bullying of a disabled student, despite the fact that Google had a notice and takedown system in place that resulted in the prompt removal of the video from the site.[104] These liability risks and uncertainties reportedly have a chilling effect on the legitimate activities of digital companies.[105]

Censorship Measures

Censorship of Internet content and platforms reportedly takes place throughout the world. Although different monitoring organizations focus on different aspects of this censorship, they generally agree that it is pervasive and that certain countries are particularly problematic (table 5.4).[106] Moreover, industry and government experts are concerned that countries that engage in regular and pervasive censorship (including China, Iran, and Saudi Arabia) have been successful in obtaining a greater role for the International Telecommunications Union (ITU) in regulating the Internet, in contravention of the consensus-driven and multi-stakeholder approaches that have been successful in other forums.[107]

Testimony at the Commission's hearing indicated that the outright blocking and filtering of U.S. Internet platforms and content is the most direct barrier to digital trade for many companies, and that its costs are substantial.[108] Google has described direct blocking and filtering as being akin to a customs official stopping all goods from a particular company at the border.[109] For example, when China blocks Facebook, Twitter, and Google Docs, those services are completely precluded from doing business.[110] China's Internet censorship practices are described in greater detail below (box 5.8).

Some countries also subject foreign Internet intermediaries to a greater level of blocking or filtering of Internet content than domestic providers. For example, foreign Internet service providers in China and Vietnam must pass through gateways that domestic content is able to avoid. These obstacles degrade the speed and quality of service of U.S. companies as compared to their domestic competitors by frequently timing out users or otherwise making the foreign site inconvenient to use.[111] Similarly, according to IIPA, foreign music and entertainment software companies must comply with discriminatory or

[104] Wolf and Maxwell, "So Close, Yet So Far Apart," 2012, 9.

[105] Uncertainty about governing legal standards is not limited to intermediary liability for copyright infringement. Several companies interviewed also raised concerns about the scope of patent protection in the United States and abroad for Internet and software-related inventions. Industry representatives, interviews by USITC staff, San Francisco, CA, April 16, 2013.

[106] Detailed information about online censorship is available from numerous sources, including the OpenNet Initiative (ONI), Freedom House, and Reporters Without Borders (RWB). ONI is a collaborative partnership between three institutions: the Citizen Lab (Munk School of Global Affairs, University of Toronto); the Berkman Center for Internet & Society (Harvard); and the SecDev Group (Ottawa). Freedom House and RWB are independent, nonprofit organizations.

[107] SIIA, Letter to the Honorable Greg Walden et al., February 4, 2013; Kruger, "Internet Governance and the Domain Name System," January 2, 2013, 6–7.

[108] Ibid.

[109] Google, "Enabling Trade," November 2010, 6.

[110] CCIA, written submission to the USITC, February 27, 2013, 4–5.

[111] Ibid.; industry representatives, interview by USITC staff, Washington, DC, April 22, 2013.

TABLE 5.4 Censorship-related barriers to digital trade, by source

Country	Open Network Initiative Pervasive censorship of Internet tools or of political, social, or conflict-related content	Freedom House Rated "Not Free" based on obstacles to access, limits on content, and violations of user rights	Reporters Without Borders "Enemies of the Internet" based on drastic content filtering and access restrictions, tracking of cyber-dissidents and news providers, and online propaganda
Armenia	X	([a])	([a])
Bahrain	X	X	X
Belarus	([b])	X	X
Burma	X	X	X
China	X	X	X
Cuba	([a])	X	X
Ethiopia	X	X	([a])
Gaza and the West Bank	X	([a])	([a])
Indonesia	X	([b])	([a])
Iran	X	X	X
Kuwait	X	([a])	([a])
North Korea	([a])	([a])	X
Oman	X	([a])	([a])
Pakistan	X	X	([a])
Qatar	X	([a])	([a])
Saudi Arabia	X	X	X
South Korea (Republic of Korea)	X	([b])	([b])
Sudan	X	([a])	([a])
Syria	X	X	X
Thailand	([b])	X	([b])
Turkmenistan	X	([a])	X
United Arab Emirates	X	([a])	([b])
Uzbekistan	X	X	X
Vietnam	X	X	X
Yemen	X	([a])	([a])

Sources: ONI, "Global Internet Filtering in 2012," April 2012; Freedom House, *Freedom on the Net 2012*, 2012; RWB, *Internet Enemies Report 2012*, 2012.

[a]Data not available.
[b]Data available and did not meet criteria.

onerous content review systems that impose lengthy delays, wiping out the short, viable window for legitimate distribution of their products in China and Vietnam. By contrast, pirated material enters the markets unrestricted.[112]

Also, governments that block the free flow of information on the Internet may undermine the activities of Internet content providers and intermediaries, the companies that rely on them, consumers' access to information, and the openness that fuels the Internet's contribution to economic growth.[113] As Google has noted, Internet filtering makes it harder for companies to reach their customers and for businesses to enjoy the full productivity benefits of the Internet.[114] Like increasing the efficiency of ports or of the

[112] IIPA, written submission to the USITC, February 28, 2013, 9; MPAA, written submission to the USITC, March 7, 2013; AAP, written submission to the USITC, March 14, 2013, 4.
[113] Google, "Enabling Trade," November 2010, 8.
[114] According to a study done for the Australian government, experimental Internet filtering at the ISP level substantially degraded network performance; when this filtering is applied only to foreign websites, they can become a second-best option to local competitors. Google, "Enabling Trade," November 2010, 8.

BOX 5.8 Online censorship in China

The Chinese government reportedly uses a variety of methods to control online information, including these:

- A policy, popularly known as the Great Firewall, under which the Chinese government exerts strict control over a limited system of fiber optic cables that connect networks in China to the outside world. The policy includes the blocking of websites or Internet Protocol addresses and the filtering of keywords by routers at the country's eight Internet "gateways," telecommunications company data centers, and Internet portals.

- The regulation and monitoring of Internet service providers (ISPs), who are prohibited from disseminating information under 11 broad categories. These include information that opposes constitutional principles; compromises state security; harms the interests of the state; incites ethnic or racial hatred or discrimination; sabotages state religious policy; disseminates rumors; propagates obscenity; insults third parties; disturbs the public order; or organizes illegal activities.

- The employment of perhaps as many as 100,000 people (including Internet police, propaganda workers, and in-house monitors at thousands of domestic websites) to manually identify and delete objectionable content based on central and local government mandates that often are unpublished and change frequently.

- High-profile arrests of cyber-dissidents and unpredictable crackdowns on ISPs and other firms to promote uncertainty and self-censorship.

According to USTR, China's Internet regulation regime is exceedingly complex and nontransparent, with as many as 12 separate government entities wielding authority over Internet access and content. This complexity reportedly has resulted in numerous high-profile cases restricting U.S. firms' delivery of online services, such as search engine operations and Web domain registration. Uncertainty also continues regarding whether online services in mapping and other online content distribution methods will be permitted.

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Sources: Lum, Figliola, and Weed, "China, Internet Freedom," 2012; *Economist*, "Special Report," April 6, 2013, 5; USTR, *2013 National Trade Estimate*, 2013, 87.

regulatory environment, improving the speed and affordability of the Internet has been found to be positively and significantly associated with increased exports.[115]

Border Measures and Immigration Limits

Border measures, such as complicated customs procedures and paperwork, not only can present obstacles to the trade of physical goods but also can restrain digitally enabled trade, especially for SMEs.[116] Additionally, immigration limits may undercut the ability of digital companies to hire the best talent, according to industry representatives.[117]

Border Measures

Online marketplaces can connect a small enterprise in one part of the world with a buyer in another, and provide intermediation, communication services, and payment processing, thus enabling SMEs to reach customers around the world. For example, data from eBay show that about 20 percent of the transaction volume on its marketplace involves cross-

[115] Wilson, Mann, and Otsuki, "Assessing the Benefits of Trade Facilitation," February 2004, 12.

[116] USITC, hearing transcript, March 7, 2013, 70 (testimony of Jake Colvin, NFTC); Etsy, written testimony to the USITC, March 14, 2013; USITC, hearing transcript, March 7, 2013, 211 (testimony of Usman Ahmed, eBay).

[117] Industry representative, interview by USITC staff, San Jose, CA, April 17, 2013.

border trade.[118] Etsy, another online retailer, notes that "small sellers can connect directly to customers in any country for the price of an Internet connection."[119] The rise of online retail reportedly has spurred a corresponding rise in low-value or "micro" exports, which increased by 103 percent between 2005 and 2010, more than twice the increase for all exports.[120]

However, border measures, including duties and complicated document preparation and processing, can increase the costs associated with these small transactions to such a level that they deter digitally enabled trade, particularly SME trade.[121] Industry representatives have cited low *de minimis* values (table 5.5)—the value of an import shipment below which a company does not have to file customs paperwork or pay duties—as obstacles to digitally enabled trade.[122]

TABLE 5.5 Current *de minimis* thresholds for the United States and selected trading partners

Country	Local currency (US$ equivalent, May 2013 exchange rate)
Australia	Aus$1,000 ($967)
United States	US$200
Japan	¥10,000 ($98)
Mexico	$50[a]
European Union	€22($28)
Canada	Can$20 ($19.50)
China	CNY 50 ($8)

Sources: European Union, Council Regulation (EC) No. 1186/2009 of 16 November 2009, art. 26(1); Holloway and Rae, "De Minimis Thresholds in APEC," March 2012; Hufbauer and Wong, "Logistics Reform for Low-Value Shipments," 2011, 12.

[a]Note: source reports this threshold in US**$** and states that it is not uniformly applied across all goods.

Industry representatives have noted that increasing the *de minimis* thresholds in the United States and other countries would be a "straightforward way" to facilitate technology-enabled small business trade.[123] One study shows that increasing the U.S. *de minimis* level to $800 would increase the value of transactions handled by express delivery firms by over 8 percent for 48 different types of merchandise.[124] This point also has been made in connection with the TTIP negotiations, where industry representatives have stated that a higher *de minimis* level will "enable consumers and businesses on both sides of the Atlantic to take full advantage of the potential of e-commerce."[125]

Immigration Limitations

Digital industry representatives report that "hiring talent" is a major challenge. Companies must hire the best engineers and researchers to compete, but they have difficulty finding available and qualified U.S. employees and cannot hire foreign citizens

[118] USITC, hearing testimony, March 7, 2013, 207 (testimony of Usman Ahmed, eBay).
[119] Etsy, written testimony to the USITC, March 14, 2013.
[120] Gresser, "Lines of Light," 2012, 9.
[121] USITC, hearing transcript, March 7, 2013, 70 (testimony of Jake Colvin, NFTC).
[122] USITC, hearing transcript, March 7, 2013, 70 (testimony of Jake Colvin, NFTC); Etsy, written testimony to the USITC, March 14, 2013; USITC, hearing transcript, March 7, 2013, 211 (testimony of Usman Ahmed, eBay).
[123] USITC, hearing transcript, March 7, 2013, 212 (testimony of Usman Ahmed, eBay).
[124] Hufbauer and Wong, "Logistics Reform for Low-Value Shipments," 2011, 20.
[125] FedEx, written comments to USTR, May 10, 2013, 3.

because of visa limitations.[126] Many digital companies have stated that the "global mobility" of employees is important to U.S. competitiveness.[127]

For example, representatives of U.S. digital companies state that they rely on rapid innovation to maintain their competitive edge, and that they must hire the most competent and talented engineers from around the world to design and develop their digital products and services.[128] Recently, Facebook and other digital companies launched an advocacy organization called FWD.us, focused on immigration reform, noting that "in a knowledge economy, the most important resources are the talented people we educate and attract to our country."[129] The group supports establishing "a streamlined process for admitting future workers to ensure that we continue to promote innovation and meet our workforce needs."[130]

The H-1B visa program is the primary way for a company to hire nonimmigrant foreign workers in the United States, though there are other visas available for companies to hire temporary skilled workers.[131] The H-1B visa allows U.S. companies to employ foreign workers in specialty occupations that require theoretical or technical expertise in specialized fields, including scientists, engineers, and computer programmers.[132]

In 2013, the H1-B program reached the 65,000-visa cap for the 2014 fiscal year within the first week of the filing period.[133] For the past 10 years, applications by companies for H-1B visas have exceeded the cap every year.[134] Thus, digital and technology companies advocate increasing the number of H1-B visas granted each year. Some industry groups also have proposed clarifying, harmonizing, and broadening the definition of business visitors, or creating new visa classifications, as part of the Transatlantic Trade Investment and Partnership (TTIP).[135]

The necessity of changing U.S. visa limitations is disputed. On one hand, some groups contend that the immigration limitations do not affect the talent pool for digital companies, and they assert that increasing the number of H-1B visas will exacerbate U.S. unemployment rates of science, technology, engineering, and mathematics (STEM) workers, which are higher than they should be, and suppress those workers' wages.[136] On the other hand, some groups consider highly-skilled guest workers to be a complement, not a substitute, to U.S. labor in the IT industry.[137]

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[126] Industry official, interview by USITC staff, San Jose, CA., April 17, 2013.

[127] Intel Corporation, written comments to USTR, May 10, 2013; NFTC, written comments to USTR, May 10, 2013.

[128] Ibid.; Atkinson and Stewart, "The Real Story on Guestworkers," May 16, 2013.

[129] Zuckerberg, "Immigration and the Knowledge Economy," April 11, 2013.

[130] FWD.us. supporters include Dropbox, Accel Partners, Benchmark, SV Angel, LinkedIn, and many others. FWD.us website, http://www.fwd.us/our_supporters (accessed June 4, 2013).

[131] USCIS website, http://www.uscis.gov/portal/site/uscis (accessed June 4, 2013).

[132] USCIS, "H-1B Specialty Occupations," September 6, 2011.

[133] USCIS, "USCIS Reaches FY 2014 H-1B Cap," April 8, 2013.

[134] *Economist*, "The Visa System, Not Working," April 6, 2013.

[135] Intel Corporation, written comments to USTR, May 10, 2013.

[136] Costa, "STEM Labor Shortages? Microsoft Report Distorts Reality," November 19, 2012; Sengupta, "Tech Firms Push to Hire More Workers," April 11, 2013.

[137] Atkinson and Stewart, "The Real Story on Guestworkers," May 16, 2013.

Affirmative Principles That Support the Free Flow of Data and Information

While the request letter seeks information on notable barriers and impediments to digital trade, many experts consulted also identified affirmative policies and practices they consider necessary to foster the growth of digital industries and the dynamism of the Internet:

- First, and most importantly, the free flow of data and information across countries should be the norm. Reliable access to data is essential to the success of firms and employees throughout the world.[138]

- Necessary restrictions on data flow must comply with existing trade disciplines. That is, they must be designed and applied in a nondiscriminatory, proportional, and transparent manner, and be the least trade restrictive possible.[139]

- Regulations in such areas as privacy and security should strive for common ground. The question of what rules govern Internet activities is a difficult one for many firms, particularly SMEs. Developing understanding about the reasons for regulations and finding common ground among them whenever possible reduces the burden and complexity of doing business online and thus fosters innovation.[140]

- Consensus-driven, multi-stakeholder approaches to Internet governance are essential. Internet governance models that are open to private and public stakeholders and that reach consensus through bottom-up and transparent processes are preferred to the command-and-control governance models.[141]

- Trust is fundamental to digital trade. The belief that the Internet will behave as expected, and that the companies and technologies with which consumers interact online will meet expectations, is essential.[142] For example, Internet users must be able to trust that when they provide their credit card information to a site, the information will be safeguarded and used only for its intended purpose;

[138] National Foreign Trade Council, "Promoting Cross-Border Data Flows," November 2011, 3; Meltzer, "The Internet, Cross-Border Data Flows, and International Trade," February 2013, 17; USITC, hearing testimony, March 7, 2013, 213 (testimony of Usman Ahmed, eBay); USITC, hearing transcript, March 7, 2013, 231 (testimony of David LeDuc, Software and Information Industry Association).

[139] USITC, hearing transcript, March 7, 2013, 100 (testimony of Hosuk Lee-Makiyama, European Center for International Political Economy); USITC, hearing transcript, March 7, 2013, 101–2 (testimony of Stephen Ezell, ITIF); USITC, hearing transcript, March 7, 2013, 135 (testimony of Joshua Meltzer, Brookings Institution); USITC, hearing transcript, March 7, 2013, 124 (testimony of Jake Colvin, National Foreign Trade Council); CCIA, written submission to the USITC, February 27, 2013, 6.

[140] USITC, hearing transcript, March 7, 2013, 192–93 (testimony of Joshua Meltzer, Brookings Institution); USITC, hearing transcript, March 7, 2013, 52–53 (testimony of Christopher Wolf, Hogan Lovells); USITC, hearing transcript, March 7, 2013, 122–23 (testimony of Susan Aaronson, George Washington University).

[141] SIIA, Letter to the Honorable Greg Walden et al., February 4, 2013; industry representatives, interview by USITC staff, Washington, DC, April 22, 2013.

[142] To foster continued trust in the Internet in light of recent news about the National Security Agency's PRISM program, Internet intermediaries have requested permission from federal law enforcement officials to publish more detailed information about their handling of government data requests. Washington Post, "Tech Companies Urge U.S. to Ease Secrecy Rules on National Security Probes," June 11, 2013.

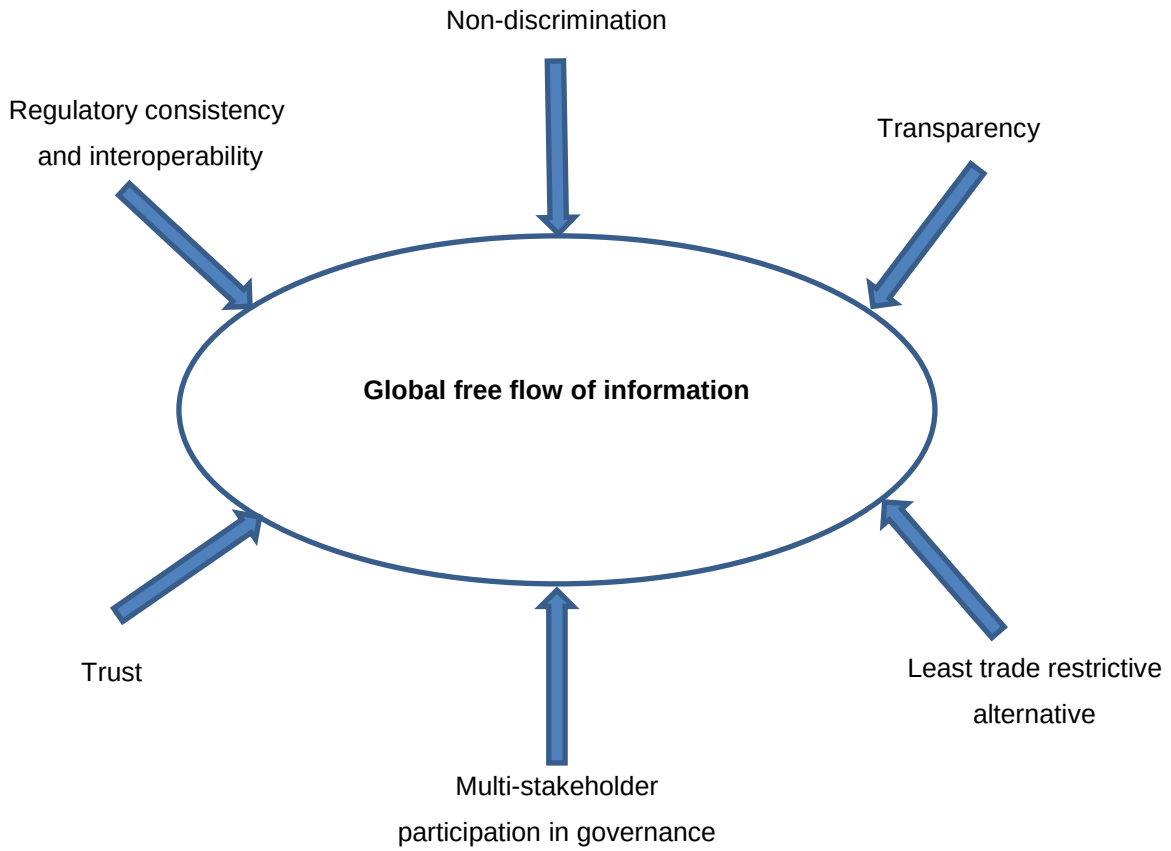
> without this guarantee, online commerce would collapse. Companies also must be able to trust in governments to protect their intellectual property online.[143]

These principles, presented in figure 5.1 below, substantially overlap with the essential elements of good regulatory practice, which the WTO considers a critical tool for preventing unnecessary technical barriers to trade.[144]

[143] USITC, hearing transcript, March 7, 2013, 102–3 (testimony of Edward Gresser, Globalworks Foundation, Progressive Economy); see also White House, "International Strategy for Cyberspace," May 2011.

[144] Johnson, "The Role of Good Regulatory Practice," October 2009, 3; USTR, *2013 Report on Technical Barriers to Trade*, April 2013, 21.

FIGURE 5.1 Affirmative principles supporting the free flow of information



Source: USITC hearing, March 7, 2013.

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CHAPTER 6
Potential Approaches for Assessing the Contributions of Digital Trade to the U.S. Economy

In the request for this investigation, the Commission was asked to provide a report that "outlines potential approaches for assessing the linkages and contributions of digital trade to the U.S. economy, noting any challenges associated with data gaps and limitations. Such contributions and linkages may include effects on consumer welfare, output, productivity, innovation, business practices, and job creation."[1] These analytical approaches will be employed in the Commission's follow-up investigation, *Digital Trade in the U.S. and Global Economies, Part 2* (hereinafter *Digital Trade 2*). This chapter outlines relevant literature, data limitations, and potential approaches for assessing the contribution of digital trade to the U.S. economy.

Analytical Framework for Assessing Contributions

To assess the contributions of digital trade to the U.S. economy, it is important to understand how the economy can benefit from the development and application of new digital technologies. These benefits can be grouped into six categories. First, digital trade can increase output and employment in the U.S. economy.[2] Second, it can increase consumer welfare by reducing prices and by increasing the variety of goods and services available to consumers. The benefits to consumers are not captured in gross domestic product (GDP) calculations but can be a significant part of the economic contribution of digital trade. Third, digital trade can significantly increase U.S. exports, especially exports of services, by increasing the efficiency of their delivery.[3] Fourth, digital trade can improve business practices, especially for small and medium-sized enterprises (SMEs), leading to better coordination of multinational supply chains and a reorganization of U.S. companies.[4] Fifth, digital trade can promote innovation and increase labor productivity.[5] Finally, engaging in digital trade can improve the financial performance of individual U.S. companies, particularly SMEs, by increasing efficiency and increasing sales.

The most common way to quantify the contribution of an economic activity to the overall U.S. economy is to use an accounting approach. An accounting approach involves

[1] See request letter in appendix A.

[2] Chapters 2 and 3 provide many examples of firms in the digital content industry and digitally enabled industries that are growing much faster than the rest of the economy.

[3] Chapter 4 discusses these effects in its analysis of trade in services and foreign direct investment.

[4] Chapters 2 and 3 provide examples of industries that have shifted their business models in response to the rise in digital trade. For example, as described in chapter 2, creators in the content industries are now better able to directly access their consumers. As discussed in chapter 3, a recent survey of American adults found that a majority now prefer online banking to traditional forms of retail banking.

[5] Chapter 3 provides an illustration of ways Internet technologies can reduce costs and improve care in the healthcare industry.

identifying the industries, firms, or parts of firms that take part in the activity and summing their relevant sales or employment levels.[6] This is a straightforward way to estimate the size of the activity. In some cases, the accounting approach is top-down: it starts with available statistics for broad economic aggregates (like industry-level output or employment) and then allocates the aggregated values among their components. The assumptions underlying the allocations are often rough approximations based on analysts' judgment.[7] The advantage of top-down calculations is that they provide more comprehensive measures of overall economic activity, though the resulting estimates are less precise at more disaggregated levels. In other cases, the accounting approach is bottom-up, based on a survey of market participants that provides information about their individual activities. The advantage of bottom-up calculations is that they may be able to target the activity more precisely than top-down calculations, though the resulting measures usually reflect economy-wide contributions less comprehensively, given the limited size of most surveys.

The greatest limitation of the accounting approach, either top-down or bottom-up, is that it usually does not provide an estimate of the *net effects* of the activity on the economy. Accounting totals measure the share of the economy that fits the definition of the activity, but it is not clear what they imply about the benefits and costs of the activity to the economy. For example, if a sector is large and growing, does that mean that it benefits the economy?

Economists usually think of an activity's contribution as the benefits from the activity minus any reduction in the economy that results from the reallocation of scarce resources and the diversion of limited budgets. In this case, the benefits of the emergence and application of the new digital technologies should be at least partially offset by the opportunity costs of reductions in other parts of the economy. For example, employment growth in online industries (or in the online aspect of traditional industries) is often seen as being associated with declines in more traditional industries.[8]

The traditional tools for analyzing net economic effects are statistical analysis and simulation models. They can be used to quantify the contribution of digital trade to the U.S. economy. These tools are described at length below.

[6] Several of the sections in chapter 2 use an accounting approach when they report the size of specific industries that engage in digital trade. For example, the chapter measures the growth of revenues and employment in the U.S. social networking industry. The chapter takes a similar approach when measuring the size of the software publishing industry.

[7] The literature review in the chapter provides examples of this method and the approximations that it entails.

[8] This is often referred to as the process of "creative destruction." Chapter 2 notes that employment declines from 2007 to 2011 were most pronounced in the traditional publishing (book, newspaper, periodical, and directory) and sound recording industries, compared to employment growth in online publishing and broadcasting and Web search portals during the same period.

Literature on Quantifying the Effects of Digital Trade

This chapter reviews prior studies that have tried to quantify the economic contribution of digital trade. The studies come from many different sources, including academics, industry groups, federal agencies, and international agencies. The studies reviewed here focus on estimates of the economic impact of the Internet rather than estimating the much broader economic impact of information and communications technologies (ICT). The Internet studies vary in the economic effects that they try to estimate and the methodologies and data sources that they use. Most of the studies use an accounting approach, though some use economic models. None of the studies addresses digital trade precisely as it is defined in the Commission's investigation, and none provides a comprehensive analytical framework that addresses all of the issues being considered in the current study.[9]

Table 6.1 summarizes the findings in eight of the most relevant estimates in the recent literature. The rest of this section provides more detail about these eight studies and many others.

The Effects on GDP and Employment

Several of the studies conclude that digital trade-related industries contribute significantly to output and employment in the United States.[10] The most common way to measure the contribution of the Internet to GDP is the accounting approach described above. The studies identify and then sum the value of all consumption, private investment, public expenditures, and net exports that are related to the Internet, including investments in infrastructure. One 2011 study estimates that expenditures related to the Internet accounted for 3.8 percent of U.S. GDP in 2009.[11] The study combines a top-down accounting approach with a bottom-up accounting approach. The authors start with aggregate data on expenditures by sector and then allocate these expenditures based on their estimates of the portion related to the Internet. For example, in order to estimate the Internet portion of sales of electronic equipment, they apply a ratio based on the overall time spent on the Internet against the total time using the product. One 2012 study uses an accounting approach to estimate the contribution of the Internet to the U.S. economy.[12] The authors estimate that the Internet economy accounted for 4.7 percent of U.S. GDP in 2010. They forecast that this share will rise to 5.4 percent of U.S. GDP by 2016. Another 2012 study estimates the contribution of the advertising-supported Internet to the U.S. economy using a bottom-up, firm-by-firm accounting approach. These authors estimate that the Internet contributed approximately $530 billion to U.S. GDP in 2011, or about 3.5 percent of U.S. GDP that year.[13]

[9] The scope of this investigation is discussed in chapter 1 of this report. Limitations in official U.S. statistics on digital trade are discussed in chapter 4.

[10] For example, a 2012 study finds that the Internet is a pervasive aspect of the basic U.S. economic infrastructure. Lehr, "Measuring the Internet: The Data Challenge," 2012.

[11] McKinsey Global Institute, "Internet Matters: The Net's Sweeping Impact on Growth, Jobs, and Prosperity," May 2011.

[12] This study does not clearly explain the underlying methodology it used and adjustments it made to the data. Dean et al., "The $4.2 Trillion Opportunity: The Internet Economy in the G-20," March 2012.

[13] Deighton and Konfeld, "Economic Value of the Advertising-Supported Internet Ecosystem," 2012.

TABLE 6.1 Estimates of economic effects of digital trade in eight recent studies

Authors (publication year)	Economic effects examined	Estimates	Scope	Methods and data used
Borga and Koncz-Bruner (2011), U.S. Department of Commerce (USDOC), Bureau of Economic Analysis (BEA)	international trade	U.S. exports of ICT-enabled private services grew 193% between 1998 and 2010. The United States exported $324 billion in ICT-enabled services in 2010 and imported $208 billion.	ICT-enabled services sectors	Uses BEA statistics on U.S. trade in private services. Classifies certain categories of services as ICT-enabled.
Bughin et al. (2011), McKinsey & Associates	revenues, productivity	The total annual value of Internet search technologies in the United States in 2009 was $242 billion, including $57–$67 billion in increased revenues of U.S. retailers and $49–$73 billion in search-enabled productivity gains.	Internet search	Uses various data sources and valuation calculations to estimate the value of Internet search for 11 different constituency groups.
Dean et al. (2012) Boston Consulting Group	SMEs, GDP	The Internet economy accounted for 4.7% of U.S. GDP in 2010. Consumers value Internet access at $1,000–$3,500 per year, depending on their age. Also, the growth rate of SMEs was 15 percentage points higher if they made extensive use of the Internet.	all Internet	Uses an expenditure method to estimate the contribution of the Internet to GDP. Uses surveys to estimate the Internet's value to consumers and the impact on the growth of SMEs.
Deighton and Kornfeld (2012), Interactive Advertising Bureau	employment	The consumer-facing layer of Internet industries added approximately 365,000 jobs between 2007 and 2011, while the consumer support services layer added approximately 245,000 jobs.	all Internet industries	Uses advertising revenues and a variety of other data sources to estimate the contribution of the advertising-supported Internet to the U.S. economy. Calculates a dollar figure for Internet industries and then applies an employment multiplier to calculate the number of indirect jobs.
Goolsbee and Klenow (2006)	consumer welfare	The consumer gains from residential Internet usage were more than $3,000 per year for the median person in 2005.	residential Internet use	Uses information on time spent online and expenditures from a survey. Uses an econometric model to calculate changes in equivalent variation, a measure of consumer welfare.
McKinsey Global Institute (2011)	GDP, employment, profitability	In 2009, the Internet contributed 3.8% of U.S. GDP, a $500 average increase in GDP per capita, 2.6 jobs created for every one destroyed, and $64 billion in increased consumer welfare. Internet usage increased SMEs' profitability by about 10%.	all Internet	Based on a global survey of more than 4,800 SMEs in the G8, Korea, Sweden, Brazil, China, and India. Uses an expenditure method and OECD data, adjusted for each sector, to estimate the contribution of the Internet to U.S. GDP.
Olarreaga et al. (2012), eBay	international trade, GDP	International trade costs are 60% lower for eBay transactions than for offline trade. There would be a 15.6% increase in real GDP if all trade were to go online.	a small share of on-line eBay transactions	Uses information on eBay transactions and total trade values to estimate a gravity model of the effect of international distance on trade.
USDOC, Census Bureau (2012)	e-commerce	In 2010, e-commerce accounted for 46.4% of the shipments of U.S. manufacturers and 24.6% of wholesalers' shipments.	all of the domestic and international shipments of U.S. establishments	Uses Census Bureau data collected in an annual survey of firms.

Source: Compiled by USITC.

Note: The G8 countries are Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States.

Two of these economic studies also estimate the contribution of the Internet to employment in the United States.[14] Based on a global survey of more than 4,800 SMEs in the G8 countries, South Korea, Sweden, Brazil, China, and India, one 2011 study estimates that the Internet created 2.6 jobs for every job that it destroyed in 2009.[15] In a 2012 study, the authors estimate the direct and indirect employment that the Internet has added to the U.S. economy.[16] First, they compute the number of jobs that depend on the existence of the Internet and the associated wage bill. This is an accounting approach based on the revenues and employment reported by large firms in the industry. Then they compute indirect employment by applying sectoral employment multipliers derived from statistics on industry employment requirements from the U.S. Department of Labor (USDOL).[17] The authors estimate that the consumer-facing layer of the Internet industries (i.e., the content and service providers discussed in chapter 2, such as Facebook, Twitter, and YouTube) added 365,000 jobs to the U.S. economy between 2007 and 2011, and the consumer support services layer (i.e., marketing, programming, and navigation support to these Internet content providers) added another 245,000 jobs.

The Effects on Consumer Welfare

Digital trade can create significant benefits to consumers—benefits that are not captured in expenditure-based estimates of its contribution to GDP. As discussed in chapter 3, a significant amount of digital content is provided for free or using an advertisement-supported business model, and it is not possible to quantify its entire economic value by adding up the online expenditures of consumers. Besides supplying free services, the Internet has made it easier to compare prices; this development has sharpened competition among retailers, stimulated innovation among producers who are seeking to distinguish themselves from their rivals, and driven prices lower. It has increased convenience and the variety of products available to consumers. Economists usually measure these additional benefits by calculating consumer surplus, which is a measure of consumer welfare.[18]

One 2003 study estimates the benefit to consumers from the introduction of new products—in this case, the value of the availability of obscure books through online booksellers.[19] The study estimates that the Internet-facilitated availability of obscure books increased consumer welfare by $700 million to $1 billion in 2000. The limitation of this study, from the perspective of an investigation of digital trade, is that it is very narrowly focused. Authors of a later study estimate the consumer gains from all residential Internet usage in 2005.[20] These authors use survey data on time usage to econometrically estimate consumer benefits. They estimate that the increase in consumer welfare from residential Internet usage was more than $3,000 per year for the median person in 2005, or approximately 2 percent of income.

[14] In the hearing for the investigation, Steven Stewart discussed the difficulty of measuring employment effects because they spill over across industries. USITC hearing transcript, March 7, 2013, 312 (testimony of Steven Stewart, IBM).

[15] McKinsey Global Institute, "Internet Matters: The Net's Sweeping Impact on Growth, Jobs, and Prosperity," May 2011. The G8 countries are Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States.

[16] Deighton and Konfeld, "Economic Value of the Advertising-Supported Internet Ecosystem," 2012.

[17] The employment multiplier calculations estimate the spillover effects across industries, but the calculations are based on a different methodology than that of the computable general equilibrium models discussed below.

[18] Technically, consumer surplus is the monetary equivalent of the benefits that consumers receive when they acquire a product or service for a price below the maximum price that they are willing to pay.

[19] Brynjolfsson, Hu, and Smith, "Consumer Surplus in the Digital Economy," November 2003.

[20] Goolsbee and Klenow, "Valuing Consumer Products by the Time Spent Using Them," 2006.

One study estimates households' willingness to pay for improvements in Internet service characteristics based on a 2009 survey.[21] The authors find that the typical household is willing to pay $20 per month for more reliable service and $45 to $48 per month for faster speed. They find that the consumers' willingness to pay increases with education, income, online experience, and youth. A 2012 study, which is discussed above, also reports survey evidence about how individuals value the Internet.[22] The authors of that study calculate consumer surplus as the difference between the value of Internet access to the consumer and the amount that the consumer currently pays for access, devices, and content. They find that consumers below the age of 25 derive an estimated $3,000 worth of value from using the Internet over the course of the year. Similarly, they find that consumers between ages of 25 and 54 derive an annual benefit of $1,000 from using the Internet, while consumers above age 54 derive an annual benefit of $3,500.

The Effects on U.S. Exports

Online platforms facilitate commerce, especially international trade in services.[23] One 2011 study estimates that U.S. exports of IT-enabled private services grew by 193 percent between 1998 and 2010, while total U.S. exports of private services increased by a more modest 117 percent.[24] The authors estimate that U.S. exports of IT-enabled private services totaled $324 billion in 2010.

A 2012 study reports an econometric analysis of the difference in the effect of international distance on online and offline trade flows.[25] The authors estimate a gravity model of international trade.[26] They find that the effect of international distance on international trade flows is 60 percent smaller for eBay transactions than for comparable offline trade.[27] They emphasize that online platforms are a growth opportunity for firms of all sizes, in both developed and developing countries.

The Effects on Business Practices

There is a large volume of literature that discusses how digital trade is reshaping the ways that U.S. companies and their foreign competitors do business, especially SMEs.[28] These studies are usually based on detailed surveys of market participants.

[21] Rosston et al., "Household Demand for Broadband Internet Service," January 29, 2010.

[22] Dean et al., "The $4.2 Trillion Opportunity: The Internet Economy in the G-20," March 2012.

[23] A 2012 study provides an overview of the different sources of statistical evidence on international trade in digital goods and services, but does not offer new estimates. Gresser, "Lines of Light: Data Flows as a Trade Policy Concept," 2012.

[24] Borga and Koncz-Bruner, "Trends in Digitally-Enabled Trade in Services," 2011.

[25] Olarreaga et al., *Enabling Traders to Enter and Grow on the Global Stage*, 2012.

[26] A gravity model is an econometric model that explains trade flows between two countries in terms of the size of the two countries, the distance between them, and other impediments to international trade.

[27] In a set of counterfactuals, the authors estimate that there could be a 15.6 percent increase in real GDP if all transactions were to go online, due to this reduction in trade costs.

[28] In the hearing for this investigation, Jake Colvin stated that digital trade levels the playing field for small business and entrepreneurs. USITC hearing transcript, March 7, 2013, 66–68 (testimony of Jake Colvin, National Foreign Trade Council). Edward Black stated that the Internet functions as a commerce-facilitating platform. USITC hearing transcript, March 7, 2013, 215 (hearing testimony of Edward J. Black, Computer & Communications Industry Association). Steven Stewart stated that digital trade has a significant effect on the operations of global companies that should be considered in the Commission's investigation. USITC hearing transcript, March 7, 2013, 200–01 (hearing testimony of Steven Stewart, IBM).

A 2008 publication reports the results of a survey of senior executives in March 2008.[29] The authors find that the Internet has significantly influenced how companies interact with their customers, including customer-driven innovation and customization. The study finds a more modest effect on intrafirm communications and knowledge management. A 2012 study reports the results of a joint research project that included a survey of 469 senior executives in 391 large companies around the world.[30] The authors find that technology advances have significantly changed customer engagement, internal operations, and even business models. Finally, the U.S. Census Bureau estimates the share of e-commerce in the revenues of U.S. firms, based on survey responses.[31] These data are discussed at length in chapter 4.

The Effects on Innovation and Productivity

Another way in which digital trade affects the U.S. economy is through product innovation. Almost all digital products and services have been introduced within the last decade—a significant number, within the last few years. While some represent a new way of delivering traditional products, others are uniquely available online, as discussed in chapter 3.

In addition to its contribution to product innovation, digital trade can reduce costs and increase the productivity of firms. There is a large volume of literature on the effects of investments in information technology (IT) on productivity in the U.S. economy (summarized in box 6.1) and a smaller but still significant amount of literature on the effects of Internet use on productivity.

BOX 6.1 Studies of the effects of IT investments on productivity

Studies of the effects of IT investments on productivity generally conclude that IT investments made a significant contribution to the growth of the U.S. economy in the 1990s, but that their contribution declined after 2000. For example, one study finds that the use of computer networks raises productivity in manufacturing plants by about 7.2 percent.[a] Authors of another study estimate that IT investments were responsible for two-thirds of total factor productivity growth in the United States between 1995 and 2002, and for virtually all growth in labor productivity.[b] Another study finds that IT was a key driver of labor productivity growth in the United States between 1995 and 2000, even after accounting for variable factor utilization, adjustment costs, and intangible capital.[c] However, the contribution was smaller after 2000. These authors argue that labor productivity growth after 2000 was driven significantly by multifactor productivity growth outside the IT-producing sector. One recent study reports that IT can increase the efficiency of collaboration and information processing but that it is difficult to quantify the spillover effects.[d]

[a] Atrostic and Nguyen, "IT and Productivity in U.S. Manufacturing: Do Computer Networks Matter?" July 2005.
[b] Atkinson and McKay, "Digital Prosperity: Understanding the Economic Benefits of the Information Technology Revolution," March 2007.
[c] Oliner et al., "Explaining a Productive Decade," August 2007.
[d] Kretschmer, "Information and Communication Technologies and Productivity Growth," 2012.

This review focuses on the latter group, because these studies are more relevant to the scope of this investigation. One 2009 study finds that a 10 percentage point increase in

[29] EIU, *The Digital Company 2013: How Technology Will Empower the Customer*, 2008.
[30] Westerman et al., "The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry," November 2012.
[31] USDOC, Census Bureau, "E-Stats," May 10, 2012.

broadband penetration is correlated with 0.9 to 1.5 percentage point increase in annual per capita growth in OECD countries between 1996 and 2007.[32] One 2009 study estimates that one more broadband line per 100 individuals in IT-intensive countries increases productivity by 0.1 percent.[33] Another 2009 study finds a positive relationship between broadband adoption and productivity of U.S. telecommunications firms from 1995 to 2000.[34] The gains come from installing equipment that substitutes for clerical and administrative tasks but also from letting firms develop new jobs, hierarchies, and management structures. On the other hand, a 2012 study found that the Internet has had only a limited impact on the growth in U.S. productivity, causing only short-lived growth between 1996 and 2004.[35] That author also notes that a significant portion of the productivity gains attributed to IT come from the IT industry itself becoming more productive, rather than the application of IT in other industries.

Several studies show that Internet search technologies affect productivity. A 2011 study estimates the value of search technologies like Google search engines.[36] The authors use a bottom-up approach that identifies sources of search value, including time saved, price transparency, better matching of people and products, and the emergence of new business models like price comparison sites. They estimate that the annual value of these search technologies to the United States was $242 billion in 2009, including $49–$73 billion in search-enabled productivity gains. A 2013 study compares online search engines with offline library sources.[37] The authors find that people are more likely to find answers to questions on the Internet and to find them faster.

Researchers have also recognized that the Internet can have adverse effects on productivity by creating workplace distractions. For example, the authors of one paper find that the number of devices and their increased usage are creating interruptions which can erode workers' productivity.[38]

The Effects on Financial Performance

Finally, several of the studies in the literature estimate the effects of digital trade on profitability of U.S. firms based on detailed surveys of market participants. A 2011 study reports the results of a survey of SMEs in several countries.[39] The authors estimate that Internet usage by their businesses enabled a 10 percent increase in profitability. One 2012 study finds that digital leaders—firms with high levels of investment in technology-driven initiatives and a transformation-oriented management that is able to implement technology-based change—have better industry-adjusted financial performance in terms of revenue generation, profitability, and market valuation.[40]

[32] Czernich et al., "Broadband Infrastructure and Economic Growth," December 2009.
[33] LECG, "Economic Impact of Broadband: An Empirical Study," February 22, 2009.
[34] Majumdar, Carare, and Chang, "Broadband Adoption and Firm Productivity," September 2009.
[35] Gordon, "Is U.S. Economic Growth Over?" 2012.
[36] Bughin et al., "The Impact of Internet Technologies: Search," July 2011.
[37] Chen et al., "A Day without a Search Engine," March 6, 2013.
[38] Mark et al., "The Cost of Interrupted Work: More Speed and Stress," 2008.
[39] McKinsey Global Institute. "Internet Matters: The Net's Sweeping Impact on Growth, Jobs, and Prosperity," May 2011.
[40] Westerman et al., "The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry," November 2012.

Data Limitations

Attempts to quantify the economic effects of digital trade are complicated by a number of data limitations. As discussed in chapters 1–3, there are many possible ways to define digital trade, measure digital intensity, and categorize digital industries. This makes it difficult to compare estimates of digital trade across studies in the literature and across data sources.

One challenge is that digital products and services are relatively new, and statistical agencies are still developing methods for quantifying them.[41] As discussed in chapter 4, the U.S. Census Bureau publishes e-commerce statistics that report the share of the revenues of different sectors of the United States through e-commerce.[42] However, these statistics do not distinguish exports from domestic shipments, and they do not report whether the mode of delivery is physical or online. As discussed in chapter 3, the BEA estimates the share of U.S. services exports that are IT-enabled, but the estimates are based on a broad categorization of types of services rather than direct information from the underlying surveys, which do not ask whether the trade was digitally enabled.[43]

A second challenge is that digital industries are constantly innovating. It is difficult to count their new products or quality improvements, since digital products are usually not standardized. One paper identifies the rapidly changing nature of the Internet and the complexity of its value chain as the greatest data challenge to measuring the Internet.[44]

A third challenge is that transactions over the Internet are often untaxed, do not appear in the official records, and can involve illicit activities that are difficult to measure. While a great deal of information about digital trade is collected automatically as part of each digital transaction, privacy agreements and business confidentiality usually restrict the use of this information.

Potential Approaches to Quantifying Economic Effects

The Commission plans to send a survey to market participants; this will be an important and unique contribution of *Digital Trade 2*. The investigation will seek to include other analytical approaches that can complement and potentially corroborate the survey results. These additional analytical approaches are outlined in the rest of this chapter.

Survey

The survey that the Commission plans to conduct in *Digital Trade 2* should provide unique insights into the economic contribution of digital trade. The survey will be an opportunity to ask firms directly about the effect of digital technologies on their costs and

[41] For example, one researcher warns that "digital trade presents problems of coverage, concept, and [inadequate] funding of statistics and measurement." Mann, "International Trade in the Digital Age: Data Analysis and Policy Issues," November 18, 2010.

[42] USDOC, Census Bureau, "E-Stats," May 10, 2012.

[43] Borga and Koncz-Bruner, "Trends in Digitally-Enabled Trade in Services," 2011.

[44] Lehr, "Measuring the Internet: The Data Challenge," 2012.

on the customers that they serve.[45] A limitation of the survey is that the companies may be unable to estimate economy-wide effects even if they can accurately measure effects on their individual economic performance.

Statistical Analysis

In *Digital Trade 2*, the Commission will supplement the analysis of survey responses with statistical analysis using publicly available business and economic data. The statistical analysis can help to quantify economic effects that are industry-wide and that spill over into other parts of the economy. For example, a statistical analysis of the effect of digital trade on total employment in the retailing sector might address whether the increase in employment in e-commerce firms more than offsets the reduction in traditional, offline retail employment.

Statistical analysis can, in its simplest form, provide a measurement of the differences between digital industries and comparable non-digital industries that is based on public data. One common example is to compare growth rates. A perfect comparable for a digital firm or industry is another firm or industry that is identical in all respects except that it is non-digital. In this case, the difference between the growth rates of the digital firm and its non-digital comparable indicates the incremental effect of digital trade on growth. In practice, there are no perfect comparables, but in some cases it is possible to find reasonable ones. In addition, there are statistical methods, such as multivariate regression analysis, that can control for observable differences that are unrelated to digital trade. The main limitation of statistical analysis is that there are always confounding factors that cannot be measured or controlled. Nevertheless, statistical comparisons can provide useful insights.

One example of a relevant statistical analysis would be to estimate the effects of digital trade on the employment and output of digital industries in the United States, using public data from the USDOL. The first step in this analysis would be to rank U.S. industries by their digital intensity—for example, by calculating the share of each industry's workers in digital occupations.[46] Then the analysis could estimate the correlation between an industry's digital intensity in each year and its employment, while controlling for other determinants of industry employment. A next step could estimate the geographical distribution of employment in digital trade occupations and then use this information to estimate how much higher local unemployment would be absent the employment tied to digital trade.

A second example of relevant statistical analysis would be to estimate the effects of digital trade on the productivity and wages of U.S. workers, again using public data from the USDOL. The analysis would estimate the correlation between an industry's digital intensity in each year and its labor productivity. It could also use public data on individual workers' occupation, earnings, and characteristics like education and age to estimate an earnings premium in digital trade occupations.

A third example of relevant statistical analysis would be to estimate the effects of digital trade on consumer welfare. The analysis would estimate the share of recent reductions in consumer prices that were due to efficiency gains from digital trade. It may also be

[45] It is also an opportunity to ask for information about how digital trade has affected business practices and job creation and about barriers that they face.

[46] Chapter 3 provides examples of digital intensity rankings.

possible to estimate the increase in the variety of products available to consumers due to the emergence of digital trade, but this will be challenging to measure.

Simulation Models

Digital Trade 2 will likely use simulation models to estimate the economy-wide effects of digital trade, including the effects on consumer welfare.[47] Computable general equilibrium (CGE) models require many assumptions about the structure of the economy and a very large amount of economic data, but there are several CGE models that are well supplied with data and that the Commission regularly uses in its investigations.[48] These could be modified to address several of the issues in *Digital Trade 2*. The advantage of using a CGE model is that it provides an estimate of the net economic effects that take into account the connections between different sectors of the economy and economy-wide resource constraints. However, CGE models present several challenges. These models are abstract, and their data are highly aggregated. They do not measure a digital trade sector separately, and they have no variables that correspond exactly to relatively new digital technologies.

The CGE analysis of the contribution of digital trade could proceed in several steps. The first step would be to use the statistical techniques described above to estimate the change in observable macroeconomic outcomes that are attributable to digital trade—for example, the difference between the growth rates of digitally intensive U.S. services exports and the growth rates of other U.S. services exports, or the difference between the growth rates of employment in digitally intensive industries and the growth rates of employment in comparable non-digital industries. The second step would be to calibrate the trade costs in the model to the magnitude of these macroeconomic effects. This involves imputing reductions in trade costs (attributable to digital trade) that would be just large enough to generate the macroeconomic effects of digital trade that are estimated in the first step. Then the CGE model would be used to generate estimates of the impact of these reductions in trade costs on consumer welfare and on sector-specific and economy-wide output, employment, prices, and international trade.[49]

In choosing the analytical approaches to use in preparing *Digital Trade 2,* the Commission will consider employing a combination of these separate but complementary approaches—a survey, statistical analysis of public data, and simulation modeling of the economy. Rather than relying on a single model to generate all of the quantitative estimates, the Commission will consider a number of methods and datasets to quantify different parts of the problem.[50] *Digital Trade 2* also will include case studies that examine the importance of digital trade to selected U.S. industries that produce or use such products and services.

[47] Simulation models are mathematical models that are based on economic theory and are calibrated to economic data. They are a common tool for assessing the economic effects of changes in technologies or policies.

[48] CGE models are a type of simulation model. They quantify how an economy in equilibrium might react to changes in policy, technology, or other external factors. CGE models are also referred to as applied general equilibrium (AGE) models.

[49] *Digital Trade 2* will probably not use CGE models to quantify the effects of digital trade on innovation, business models, or firm profitability, since these issues are not addressed in conventional CGE models.

[50] This segmented approach was recommended by industry expert Steven Stewart at the hearing. USITC hearing transcript, March 7, 2013, 282–83 (testimony of Steven Stewart, IBM).

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APPENDIX A
REQUEST LETTER

United States Senate

COMMITTEE ON FINANCE

WASHINGTON, DC 20510–6200

December 13, 2012

The Honorable Irving A. Williamson
Chairman
U.S. International Trade Commission
500 E Street, SW
Washington, DC 20436

Dear Chairman Williamson,

I am writing to request that the U.S. International Trade Commission (Commission) conduct two investigations under section 332(g) of the Tariff Act of 1930 (19 U.S.C. §1332(g)) regarding the role of digital trade in the U.S. and global economies.

Digital trade has increased rapidly in recent years, and is an increasingly important activity within the global economy. The emergence of digital trade is part of the broader transformation in global economic activity associated with the Internet. According to researchers, the Internet has fostered GDP growth, improved productivity for large and small firms, acted as a catalyst for job creation, and provided substantial value to individual users. At the same time, policymakers are facing unprecedented challenges as they seek to ensure that digital trade remains open while producers' and consumers' data remain secure.

To assist in better understanding the role of digital trade in the U.S. economy as well as the aforementioned challenges, I request that the Commission conduct two investigations and provide the reports, as described below.

Investigation 1: Based on a review of literature and other available information, I request that the Commission provide a report that, to the extent practicable:

- Describes U.S. digital trade in the context of the broader economy.
- Examines U.S. and global digital trade, the relationship to other cross-border transactions (e.g., foreign direct investment), and the extent to which digital trade facilitates and enables trade in other sectors.
- Describes notable barriers and impediments to digital trade.
- Outlines potential approaches for assessing the linkages and contributions of digital trade to the U.S. economy, noting any challenges associated with data gaps and limitations. Such contributions and linkages may include effects on consumer welfare, output, productivity, innovation, business practices, and job creation.

The report should be delivered seven months from the date of this letter.

Investigation 2: Based on available information—including a survey of U.S. firms in selected industries particularly involved in digital trade and the application of approaches outlined in the first report—I request that the Commission provide a second report that, to the extent practicable:

- Estimates the value of U.S. digital trade and the potential growth of this trade. Potential growth estimates should highlight any key trends and discuss their implications for U.S. businesses and employment.
- Provides insight into the broader linkages and contributions of digital trade to the U.S. economy. Such linkages and contributions may include effects on consumer welfare, output, productivity, innovation, business practices, and job creation.
- Presents case studies that examine the importance of digital trade to selected U.S. industries that use or produce such goods and services. If possible, some of the case studies should highlight the impact of digital trade on small and medium-sized enterprises (SMEs).
- Examines the effect of notable barriers and impediments to digital trade on selected industries and the broader U.S. economy.

The Commission's approach to fulfilling these objectives should be shaped by the extent to which it can develop appropriate analytical frameworks and collect the requisite data.

This second report should be delivered nineteen months from the date of this letter.

I intend to release both of the reports to the public in their entirety. Therefore, neither report should contain any confidential business or national security information.

Sincerely,

Max Baucus
Chairman

APPENDIX B
Federal Register Notice

COLORADO

El Paso County

Wolfe, John, House, 905 W. Cheyenne Rd., Colorado Springs, 12001193

DISTRICT OF COLUMBIA

District of Columbia

Hamilton Hotel, 1001 14th St. NW., Washington, 12001194
Wire Building, 1000 Vermont Ave. NW., Washington, 12001195

FLORIDA

Indian River County

Osceola Park Historic Residential District, Bounded by 20th & 18th Sts., 20th & 23rd Aves., Vero Beach, 12001196

KENTUCKY

Boyle County

Second Street Christian Church, 228 S. 2nd St., Danville, 12001197
St. James AME Church, 124 E. Walnut St., Danville, 12001198

Christian County

Attucks High School, 712 1st. St., Hopkinsville, 12001199

Knott County

Amburgey Log Home, 105 Dead Mare Branch, Mallie, 12001200

Marion County

Gravel Switch Historic District, Along KY 243, E. Railroad Ave. & Aliceton Rd., Gravel Switch, 12001201
Loretto Historic District, (Crossroads Communities in Kentucky's Bluegrass Cultural Landscape Region MPS) Along KY 49 & KY 52, Loretto, 12001202

Washington County

Mackville Historic District, (Crossroads Communities in Kentucky's Bluegrass Cultural Landscape Region MPS) Along KY 433 & KY 152, Mackville, 12001203
Willisburg Historic District, (Crossroads Communities in Kentucky's Bluegrass Cultural Landscape Region MPS) Along KY 433 & KY 53, Willisburg, 12001204

LOUISIANA

Madison Parish

Tallulah Coca-Cola Bottling Plant, N. Plum & E. Green Sts., Tallulah, 12001205

Rapides Parish

Guaranty Bank, Park Avenue Branch, 403 Bolton Ave., Alexandria, 12001206

MISSOURI

Howard County

New Franklin Commercial Historic District, 106–136 & 101–113 E. Broadway, New Franklin, 12001207

NEW YORK

Steuben County

New York State Soldiers' and Sailors' Home—Bath Veterans Administration Center Historic District, 76 Veterans Ave., Bath, 12001208

OHIO

Ashland County

Downtown Ashland Historic District, Roughly bounded by Cottage-Claremont Ave., 3rd, 4th, & Union Sts. & Town Cr., Ashland, 12001209

Cuyahoga County

Baldwin—Wallace College North Campus Historic District, Bounded by Bagley & E. 5th Aves., Front & Beech Sts., Berea, 12001210
Carroll, John, University North Quad Historic District, 1 John Carroll Blvd., University Heights, 12001211
East Ohio Building, The, 1717 E. 9th St., Cleveland, 12001212
Record Rendezvous, (Lower Prospect—Huron District MPS) 300 Prospect Ave., Cleveland, 12001213
West 25th Street—Detroit Avenue Historic District, Roughly bounded by Detroit Ave., Aust Ct., W. 25th & W. 28th Sts., Cleveland, 12001214

Medina County

Wheeling and Lake Erie Railroad Depot, 204 Railroad St., Lodi, 12001215

SOUTH DAKOTA

Jerauld County

Hawkeye Valley Mill, SE1/4 S23, T106N, R65W, Wessington Springs, 12001216

Minnehaha County

Sid's Crown Liquor, 330 S. 1st Ave., Sioux Falls, 12001217
Texaco Super Service Station, 330 S. 1st Ave., Sioux Falls, 12001218

Yankton County

Scottish Rite Masonic Temple, 333 Cedar St., Yankton, 12001219

VIRGINIA

Chesterfield County

Falling Creek UDC Jefferson Davis Highway Marker, (UDC Commemorative Highway Markers along the Jefferson Davis Highway in Virginia MPS) US 1 at Falling Cr. Wayside, Richmond, 12001220

WASHINGTON

King County

Bay View Brewery, 3100–3222 Airport Way S., Seattle, 12001221

Mason County

Malaney—O'Neill House, 1570 E. Agate Bay Rd., Shelton, 12001222

Yakima County

Bumping Lake Cabin No. 16, 1920 Bumping Lake Rd., Naches, 12001223

WYOMING

Sublette County

Green River Drift Trail Traditional Cultural Property, (Ranches, Farms, and Homesteads in Wyoming, 1860–1960 MPS) Generally follows upper Green R., Cora, 12001224

[FR Doc. 2013–00504 Filed 1–11–13; 8:45 am]

BILLING CODE 4312–51–P

INTERNATIONAL TRADE COMMISSION

[Investigation No. 332–531]

Digital Trade in the U.S. and Global Economies, Part I; Institution of Investigation and Scheduling of Hearing

AGENCY: United States International Trade Commission.

ACTION: Institution of investigation and scheduling of public hearing.

SUMMARY: Following receipt of a request dated December 13, 2012 (received on December 14, 2012) from the Senate Committee on Finance, (Committee) under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)), the U.S. International Trade Commission (Commission) instituted investigation No. 332–531, Digital Trade in the U.S. and Global Economies, Part I, for the purpose of preparing the first of two reports requested by the Committee.

DATES:

February 21, 2013: Deadline for filing requests to appear at the public hearing.
February 26, 2013: Deadline for filing pre-hearing briefs and statements.
March 7, 2013: Public hearing.
March 14, 2013: Deadline for filing post-hearing briefs and statements.
March 14, 2013: Deadline for filing all other written submissions.
July 14, 2013: Transmittal of Commission report to the Committee.

ADDRESSES: All Commission offices, including the Commission's hearing rooms, are located in the United States International Trade Commission

Building, 500 E Street SW., Washington, DC. All written submissions should be addressed to the Secretary, United States International Trade Commission, 500 E Street SW., Washington, DC 20436. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *https://edis.usitc.gov/edis3-internal/app.*

FOR FURTHER INFORMATION CONTACT: Project Leader Matthew Reisman (202–205–2163 or *matthew.reisman@usitc.gov*) or Deputy Project Leader Martha Lawless (202–205–3497 or *martha.lawless@usitc.gov*) for information specific to this investigation. For information on the legal aspects of these investigations, contact William Gearhart of the Commission's Office of the General Counsel (202–205–3091 or *william.gearhart@usitc.gov*). The media should contact Margaret O'Laughlin, Office of External Relations (202–205–1819 or *margaret.olaughlin@usitc.gov*). Hearing-impaired individuals may obtain information on this matter by contacting the Commission's TDD terminal at 202–205–1810. General information concerning the Commission may also be obtained by accessing its Web site (*http://www.usitc.gov*). Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000.

SUPPLEMENTARY INFORMATION:

Background: As requested, the Commission will deliver two reports to the Committee. The first report, Digital Trade in the U.S and Global Economies, Part I, will:

- Describe U.S. digital trade in the context of the broader economy;
- Examine U.S. and global digital trade, the relationship to other cross-border transactions (e.g., foreign direct investment), and the extent to which digital trade facilitates and enables trade in other sectors;
- Describe notable barriers and impediments to digital trade; and
- Outline potential approaches for assessing the linkages and contributions of digital trade to the U.S. economy, noting any challenges associated with data gaps and limitations. Such contributions and linkages may include effects on consumer welfare, output, productivity, innovation, business practices, and job creation.

For the purposes of the report, the Commission is defining ''digital trade'' to encompass commerce in products and services delivered over digital networks. Examples include software, digital media files (e.g., e-books and digital audio files), and services such as data processing and hosting. The report will also examine how other industries, such as financial services and retailing, make use of digital products and services for production and trade.

The Commission will institute a second investigation at a later date for the purpose of preparing the second report. As requested by the Committee, the second report will build on the first report to:

- Estimate the value of U.S. digital trade and the potential growth of this trade;
- Examine the broader linkages and contributions of digital trade to the U.S. economy;
- Present case studies that examine the importance of digital trade to selected U.S. industries that use or produce such goods and services; and
- Examine the effect of notable barriers and impediments to digital trade on selected industries and the broader U.S. economy.

The second report will be delivered to the Committee within 19 months. More information regarding the second report will be made available when the second investigation is instituted.

Public Hearing: A public hearing in connection with these investigations will be held at the U.S. International Trade Commission Building, 500 E Street SW., Washington, DC, beginning at 9:30 a.m. on March 7, 2013. Requests to appear at the public hearing should be filed with the Secretary, no later than 5:15 p.m., February 21, 2013, in accordance with the requirements in the ''Submissions'' section below. All pre-hearing briefs and statements should be filed not later than 5:15 p.m., February 26, 2013; and all post-hearing briefs and statements should be filed not later than 5:15 p.m., March 14, 2013. In the event that, as of the close of business on February 21, 2013, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or nonparticipant should contact the Office of the Secretary at 202–205–2000 after February 21, 2013, for information concerning whether the hearing will be held.

Written Submissions: In lieu of or in addition to participating in the hearing, interested parties are invited to file written submissions concerning this investigation. All written submissions should be addressed to the Secretary, and should be received not later than 5:15 p.m., March 14, 2013. All written submissions must conform with the provisions of section 201.8 of the *Commission's Rules of Practice and Procedure* (19 CFR 201.8). Section 201.8 and the Commission's Handbook on Filing Procedures require that interested parties file documents electronically on or before the filing deadline and submit eight (8) true paper copies by 12:00 p.m. eastern time on the next business day. In the event that confidential treatment of a document is requested, interested parties must file, at the same time as the eight paper copies, at least four (4) additional true paper copies in which the confidential information must be deleted (see the following paragraph for further information regarding confidential business information). Persons with questions regarding electronic filing should contact the Secretary (202–205–2000).

Any submissions that contain confidential business information (CBI) must also conform with the requirements of section 201.6 of the *Commission's Rules of Practice and Procedure* (19 CFR 201.6). Section 201.6 of the rules requires that the cover of the document and the individual pages be clearly marked as to whether they are the ''confidential'' or ''non-confidential'' version, and that the confidential business information be clearly identified by means of brackets. All written submissions, except for confidential business information, will be made available for inspection by interested parties. In its request letter, the Committee stated that it intends to make the Commission's reports available to the public in their entirety, and asked that the Commission not include any confidential business information or national security classified information in the reports that the Commission sends to the Committee. Any confidential business information received by the Commission in this investigation and used in preparing this report will not be published in a manner that would reveal the operations of the firm supplying the information.

By order of the Commission.

Issued: January 8, 2013.

Lisa R. Barton,

Acting Secretary to the Commission.

[FR Doc. 2013–00506 Filed 1–11–13; 8:45 am]

BILLING CODE 7020–02–P

APPENDIX C
Calendar of Witnesses for the March 7, 2013, Hearing

Office of the Secretary

UNITED STATES INTERNATIONAL TRADE COMMISSION

WASHINGTON, DC 20436

PUBLIC
HEARING MATERIALS

March 7, 2013

MEMORANDUM

TO: Docket Services
Office of Administrative Services
Office of the Secretary

FROM: William R. Bishop
Supervisory Hearings and Information Officer

SUBJECT: **PUBLIC** Hearing Materials of March 7, 2013

RE: Inv. Nos. 332-531 and 332-540 (Digital Trade in the U.S. and Global Economies: Part 1 and Part 2)

Attached please find the following **PUBLIC** hearing materials for the above referenced hearing:

1.) Memorandum of Record

2.) Final Calendar of Witnesses

3.) Hearing exhibits of Susan A. Aaronson, George Washington University

4.) Testimony of Ed Gresser, GlobalWorks Foundation

5.) Hearing exhibits of Dr. Michael Mandel, Progressive Policy Institute

6.) Hearing exhibits of Martin Abrams, Centre for Information Policy and Leadership

William R. Bishop
Supervisory Hearings and Information Officer

Office of the Secretary

UNITED STATES INTERNATIONAL TRADE COMMISSION

WASHINGTON, DC 20436

MEMORANDUM OF RECORD

RE: Investigation Nos. 332-531 and 332-540

Concerning: Digital Trade in the U.S. and Global Economies: Parts 1 and 2

A public hearing in these investigations was held on:

March 7, 2013

A copy of the calendar of this hearing is attached. For further information, consult the transcript of the hearing, the exhibits, and the minutes of the Commission.

FILED BY: _____

William R. Bishop, Supervisory Hearings and Information Officer

CALENDAR OF PUBLIC HEARING

Those listed below appeared as witnesses at the United States International Trade Commission's hearing:

Subject: Digital Trade in the U.S. and Global Economies: Part 1 and Part 2

Inv. Nos.: 332-531 and 332-540

Date and Time: March 7, 2013 - 9:30 a.m.

Sessions were held in connection with these investigations in the Main Hearing Room (room 101), 500 E Street, S.W., Washington, DC.

PANEL 1

ORGANIZATION AND WITNESS:

The George Washington University
The Elliott School of International Affairs
Washington, DC

Susan A. Aaronson, Associate Research Professor of International Affairs

GlobalWorks Foundation
ProgressiveEconomy
Washington, DC

Ed Gresser, Director

Information Technology and Innovation Foundation
Washington, DC

Stephen Ezell, Senior Analyst for Innovation Policy, Science and Technology, and International Competitiveness

The Brookings Institution
Washington, DC

Joshua Meltzer, Fellow, Global Economy and Development

PANEL 1 (continued)

ORGANIZATION AND WITNESS:

Progressive Policy Institute
Washington, DC

Dr. Michael Mandel, Chief Economic Strategist

Hogan Lovells US LLP
Washington, DC

Christopher Wolf, Partner

Centre for Information Policy and Leadership
Washington, DC

Martin Abrams, President

National Foreign Trade Council, Inc.
Washington, DC

Jake Colvin, Vice President

European Centre for International Political Economy
Brussels, Belgium

Hosuk Lee-Makiyama, Director

PANEL 2

ORGANIZATION AND WITNESS:

IBM Corporation
Washington, DC

Steven W. Stewart, Director, Market Access & Trade

eBay Inc.
Washington, DC

Usman Ahmed, Policy Counsel

Computer & Communications Industry Association
Washington, DC

Edward J. Black, President & CEO

PANEL 2 (continued)

ORGANIZATION AND WITNESS:

BSA | The Software Alliance
Washington, DC

David J. Ohrenstein, Director, Global Trade Policy

Software & Information Industry Association
Washington, DC

David LeDuc, Senior Director, Public Policy

Motion Picture Association of America, Inc.
Washington, DC

Greg Frazier, Executive Vice President

Recording Industry Association of America
Washington, DC

Mitch Glazier, Senior Executive Vice President

International Intellectual Property Alliance
Washington, DC

Michael Schlesinger, Co-Founder

Entertainment Software Association
Washington, DC

Stevan D. Mitchell, Vice President, Intellectual Property Policy

-END-

APPENDIX D
Summary of Positions of Interested Parties

The Commission held a public hearing for its investigation on *Digital Trade in the U.S. and Global Economies: Part 1* on March 14, 2013, in Washington, DC. Interested persons were also invited to file written submissions for the investigation. This appendix contains a summary of the views expressed to the Commission via testimony, written submissions, or both, and reflects only the principal points made by the participating party. The views summarized are those of the submitting parities and not the Commission. In preparing this summary, Commission staff did not confirm the accuracy of, or otherwise correct, the information summarized. For the full text of hearing testimony, written submissions, and exhibits, see entries associated with investigation no. 332-531 at the Commission's Electronic Docket Information System (https://edis.usitc.gov).

Susan A. Aaronson, Associate Research Professor of International Affairs at the Elliott School, George Washington University[1]

In a written submission and in hearing testimony, Dr. Susan Aaronson cited key findings and recommendations from a paper she prepared for the Ford and MacArthur Foundations on U.S., European Union (EU), and Canadian trade policies and their effects on Internet freedom and stability. Dr. Aaronson noted that the Internet has empowered more people to trade information, services, and goods and has transformed trade policy. As a result, according to Dr. Aaronson, policymakers in the United States, the EU, and Canada want to advance the free flow of information, but lack consensus on how to balance Internet openness (policies and procedures that allow Internet users to make their choices about services and content to create and share) and Internet stability (policies to prevent hacking and piracy). Dr. Aaronson said that many policymakers do not know how to establish a regulatory environment supportive of both Internet openness and Internet stability.

Dr. Aaronson stated that trade policies have lagged trade realities, and that the norms of the Internet (speed, transparency, and responsiveness) have yet to fully penetrate policymaking. She contends that policymakers have made Internet policies in bureaucratic silos of intellectual property rights and piracy without weighing the collective effects on Internet openness or Internet freedom. Dr. Aaronson said that officials do not coordinate policies to promote the free flow of information with policies that advance Internet freedom.

Dr. Aaronson said that the United States, the EU, and Canada should show their commitments to Internet openness by annually reporting when and why they have blocked specific applications or technologies and/or limited content to sites or domains. She said that this information would give policymakers a better understanding of how to achieve a flexible and effective balance of Internet stability and Internet openness. Dr. Aaronson also noted that the United States, the EU, and to a lesser extent Canada have worked internationally to develop principles to ensure an open and stable Internet, but she noted that these principles are neither universal nor enforceable. She recommended that

[1] USITC, hearing transcript, March 7, 2013, 8–16; Aaronson, written submission to the USITC, January 19, 2013.

policymakers develop shared principles for maintaining the one global Internet, and that they delineate steps to be taken when countries do not live up to these principles. Dr. Aaronson also said that policymakers do not know if censorship is a barrier to trade, and suggested that they ask the World Trade Organization (WTO) Secretariat to analyze if domestic policies are barriers to cross-border information flows. She recommended that WTO members use the trade policy review process to explore the trade implications of member state Internet regulations that can distort trade.

Dr. Aaronson said she has found that without policymakers' deliberately intending it, domestic policies and trade policies may gradually fracture the one global Internet and that policymakers will increasingly rely on intermediaries to warn users and creators of sites that violate domestic laws. She said that international harmonization of strategies to advance an open Internet are unlikely, given that countries have different priorities for privacy, free speech, and national security. She also noted that when countries negotiate bilateral, regional, or multilateral trade agreements, policymakers should encourage interoperability among signatories' privacy, online piracy, and security policies.

Association of American Publishers (APP)[2]

In a written submission to the Commission, Ms. M. Luisa Simpson, APP's executive director of international enforcement and trade policy, indicated that her organization was the national trade association of the U.S. book and journal publishing industry. She reported that AAP represents some 300 members, including major commercial publishers, smaller and nonprofit publishers, university presses, and scholarly societies. Ms. Simpson stated that although trade in digital products has increased significantly, the actual scope and value of digital trade and its contribution to the U.S. economy is unknown. Ms. Simpson's written submission addressed four topics: the definition of digital trade, notable barriers and limitations to digital trade, trade in digital books and related products in the U.S. publishing industry, and potential approaches for assessing the contributions of digital trade in the U.S. economy.

Ms. Simpson said that a better understanding of the scope and value of digital trade will allow policymakers to make more informed decisions when formulating policies and developing frameworks intended to protect and promote the continued growth of trade in digital products. Given the broad array of digitized publications, books, and journals now available, Ms. Simpson recommended that the Commission adopt a broader definition of digital trade—one encompassing all types of digital products and services, regardless of mode of delivery. She expressed the belief that limiting the scope of the Commission's investigation to "commerce in products and services delivered over digital networks" will underestimate the scope of digital trade. Ms. Simpson stated that the definition employed should encompass trade in products in digitized formats as well as "products and services delivered over digital networks."

The two most significant barriers or limitations to growth in the digital trade of books and journals, according to Ms. Simpson, are piracy and market access restrictions. She stated that both barriers significantly impede the ability of publishers to compete fairly in foreign markets. She explained that with the saturation of many developed markets,

[2] Association of American Publishers, written submission to the USITC, March 14, 2013.

growth opportunities for U.S. publishers are in developing markets. Ms. Simpson stated that solutions for addressing online piracy and market access barriers are crucial to the growth of digital trade and that the Commission's study may give policymakers the information they need to make more informed decisions.

AT&T, Inc.[3]

In a written submission to the Commission, Mr. Eric H. Loeb, vice president of international external affairs for AT&T, stated that his company is a leading U.S. and global provider of telecommunications network infrastructure and services. He said that AT&T provides Internet Protocol (IP)-based communications services to businesses; wireless, high-speed Internet access; local and long-distance voice services; and, increasingly, IP television services. Mr. Loeb's written submission highlighted the need to expand the benefits of competition in the global telecommunications sector to foster innovation, network reliability, improved customer service, and lower prices, as well as realize significant multiplier benefits to the global digital economy. According to Mr. Loeb, increased competition would promote demand-driven development among IT-enabled services industries and improve the productivity of consumers at all levels of income and education. He also stated that additional trade commitments are required to remove foreign barriers to digital trade and e-commerce.

Mr. Loeb cited a report by the World Bank that found that an open, competitive telecommunications market is a major driver of digital trade and electronic commerce. According to Mr. Loeb, prior to the WTO Basic Telecommunications Services Agreement (1998), telecommunications services were provided on a monopoly basis in most countries, but by 2013 many countries had fully opened their telecommunications markets and were receiving significant economic benefits as a result. He noted that the development of competitive telecommunications markets stimulates the provision of high-quality, low-cost communications that enables the spread of information and communications technology (ICT), which not only benefits U.S. consumers and all U.S. industries competing in the global market, but also encourages greater growth in the world economy.

Mr. Loeb noted that many countries have opened their telecommunications markets due to their adoption of the WTO Basic Telecommunications Services Agreement and are now receiving significant economic benefits. Mr. Loeb also noted that a significant number of WTO members have made only limited commitments in basic telecommunications sector. He said that countries should be encouraged to allow full market access for all basic telecommunications services, with no restrictions on foreign capital investment, and adhere to the regulatory principles of basic telecommunications services listed in the WTO Reference Paper. According to Mr. Loeb, the removal of restrictions on facilities-based competition significantly benefits consumers by requiring suppliers to compete; encourages lower prices and the development of new services; and allows businesses to use the most efficient technologies to win customers and lower costs.

[3] Eric H. Loeb, vice president of international external affairs, AT&T, written submission to the USITC, March 14, 2013.

Mr. Loeb stated that additional trade commitments by all countries are necessary to facilitate increased digital trade and electronic commerce. He said that the 2011 EU-U.S. Trade Principles for Information and Communication Technology Services should form the basis for such commitments. He also said that these principles should prevent governments from limiting foreign direct investment; should not prevent service suppliers from other countries from electronically transferring information internally or across borders; and should not require ICT services suppliers to use local infrastructure or establish a local presence in order to supply services. Mr. Loeb said that it is also important to ensure that other regulatory requirements do not act as discriminatory barriers to market access.

Mr. Loeb noted that AT&T and other U.S. telecommunications operators carry international traffic over vast undersea cable networks to virtually every country in the world. According to Mr. Loeb, international submarine cables carry virtually all U.S. Internet and voice and data telecommunications traffic outside North America and are the critical backbone transmutation facilities for digital trade and electronic commerce. Mr. Loeb stated that the United States is one of a handful of countries that have signed, but not ratified, the 1994 Law of the Sea Convention. He explained that because of the importance of strengthening the protection and reliability of international submarine cables, AT&T supports U.S. Senate ratification of the Law of the Sea Convention at the earliest opportunity.

BSA | The Software Alliance[4]

In a written submission and in hearing testimony, Mr. David Ohrenstein, director of global trade policy for BSA | The Software Alliance, said that his organization represents leading global companies developing software products to improve business productivity and the quality of life for consumers. According to Mr. Ohrenstein, BSA member companies include both major global software companies and small and medium-sized businesses making niche software. Mr.Ohrestein also noted that BSA members derive more half of their overall business from other countries.

Mr. Ohrestein offered an overview of the main barriers to digital trade faced by BSA members in foreign markets, including:

- Software piracy, including the unlicensed use of software by businesses and consumers. This problem is particularly acute in the world's fastest-growing information technology (IT) markets of Brazil, Russia, India, and China, where he stated the collective software piracy rate for these markets was 70 percent of software used in 2011, or nearly $18 billion in unlicensed software use.

- Restrictions on cross-border data flows, which could adversely affect cloud computing services, especially in Canada, China, Greece, India, Korea, Indonesia, Vietnam, and Malaysia.

[4] USITC, hearing transcript, March 7, 2013, 222–229; BSA, written submission to the USITC, February 28, 2013.

- Procurement discrimination by governments that restricts foreign suppliers' participation in local-government procurement markets, particularly in India, Brazil, and China.

- Manipulation of technology standards, whereby governments are increasingly developing country-specific standards and making it more difficult for foreign providers to compete.

- Overreaching security-related regulations, in which governments use requirements designated as "protecting national security" to impose restrictions on government and enterprise procurement of software and IT products.

- Persistent tariffs on IT products, given that a broad array of IT products are not adequately covered under the WTO's Information Technology Agreement (ITA).

Mr. Ohrenstein cited a recent study commissioned by the International Intellectual Property Alliance (IIPA) that found that, among other things, industries dealing in copyrighted works added $1.6 trillion (11.1 percent) to U.S. gross domestic product (GDP) in 2010; employed more than 10.6 million workers, accounting for nearly 8.2 percent of all U.S. employment, or nearly 10 percent of all private U.S. employment; and had foreign sales of $134 billion (data were for key copyright industries; computer software sales alone reportedly were nearly $100 billion).

Centre for Information Policy and Leadership[5]

In testimony at the Commission's hearing, Mr. Martin Abrams, president of the Centre for Information Policy and Leadership, said that his organization is a global policy center. He noted that there are three ways that impede data protection and privacy laws create impediments to trade: (1) data protection laws impede the transfer of data; (2) the laws do not take account of the cultural differences between the United States and its trading partners; and (3) the laws do not recognize that data and trade are one and the same.

Citi[6]

In a written submission to the Commission, Mr. Charles R. Johnson, director and senior vice president of international affairs at Citi, stated that Citi's operations comply with a wide variety of legal and regulatory requirements affecting cross-border data processing of personal information in the jurisdictions in which it operates. Mr. Johnson identified four recent trends in regulatory schemes that adversely impact cross-border data processing and hosting operations of financial institutions, including (1) laws or regulations that limit the cross-border transfer of data by requiring domestic processing of customer information, thereby requiring the establishment of local data centers; (2) local bank secrecy laws that impede cross border data processing by regulating the disclosure

[5] USITC, hearing transcript, March 7, 2013, 55–62.

[6] Charles Johnson, Director and senior vice president of International Affairs, Citi, written submission to the USITC, March 14, 2013.

of personal information; (3) local legal requirements—particularly those relating to data protection, bank secrecy, and outsourcing—that typically do not distinguish between cross-border data processing involving financial institutions and their affiliates and data processing between financial institutions and unrelated third parties, thus effectively treating affiliates as third parties and adversely affecting cross-border data processing between financial institutions and their affiliates; and (4) differing approaches to data protection safeguards that can also adversely impact the cross-border transfer of personal information.

Mr. Johnson offered a number of recommendations to protect the confidentiality and security of customer information while at the same time enabling financial institutions to use their global data-processing networks to deliver services and products in an efficient and competitive way, including the following: (1) nations should ensure global interoperability of national regulations covering cross-border data transfers and data processing; (2) local data center restrictions should be discouraged; (3) any local data center restrictions should be clear and narrowly tailored to address a specific need; (4) offshore placement of disaster recovery operations should offer customers optimal security for their personal information; (5) regulatory schemes should recognize that financial institutions have stronger control mechanisms in place for affiliate transactions than for unrelated parties; (6) regulatory frameworks should encourage the use of regulatory letters assuring rights of access to and inspection of the outsourced activities (assurance letters); (7) customer choice and consent should be recognized and encouraged; and (8) sector-specific regulations should be considered when designing any new legal or regulatory requirement.

Computer & Communications Industry Association (CCIA)[7]

In a written submission and in hearing testimony, Mr. Edward J. Black, president and CEO of CCIA, stated that the association is an international nonprofit organization that represents companies in the computer, Internet, information technology, and telecommunications industries. According to Mr. Black, the significance of the Internet to global trade cannot be overstated, since it accounted for 21 percent of GDP growth in mature economies over the last 5 years, with 75 percent of the benefits captured by companies in more traditional industries. Within the United States, according to Mr. Black, Internet services represent an extraordinary portion of the U.S. economy and provide substantial economic benefits to multiple sectors.

Mr. Black identified a number of 21st-century trade barriers to cross-border digital trade, including:

- filtering and blocking of Internet content, platforms, and services by governments to censor Internet services;

[7] Edward Black, president and CEO, CCIA, prehearing submission to the USITC, February 27, 2013.

- local data-hosting requirements, in which government policies mandate that foreign computer and communications operators set up infrastructure (such as software and servers) in the host country;

- proposed "sending party pays" regimes in Internet networks, under which some constituencies reportedly view Internet interconnections as potential sources of revenues and which, according to Mr. Black, violate the 1998 WTO e-commerce moratorium that forbids access fees on data transmission; and

- third-party liability for online intermediaries, in which Internet and e-commerce businesses would be liable for wrongful conduct of their users.

In a post-hearing submission, Mr. Black recommended that the Commission adopt a more effective definition of digital trade that (1) construes "commerce" broadly, to encompass both the exchange of value between the user and the platform, and the exchange of value between the platform and the advertisers or content developers; (2) construes "services" in a similarly broad fashion, such that the definition encompasses efficiency-enhancing functionalities such as cloud computing, hosting, and caching, as well as user-oriented functionalities such as social media, search, e-commerce platforms, and media streaming; and (3) maintains the emphasis on "over digital networks," so that digital trade is not confused with trade in goods and with digital elements.[8]

eBay, Inc.[9]

In hearing testimony, Mr. Usam Ahmed, Policy Counsel for eBay, stated that his company is enabling the future of commerce through its leading global commerce platform, as well as through its mobile applications. eBay, according to Mr. Ahmed, supports global platforms that enable small businesses to engage in exporting and that can convert English listings of small businesses into several languages in order to better access foreign buyers. He noted that its PayPal payment service allows a small business to accept payments in 24 different currencies from anyone who has an email address in the 190 countries and regions that accept PayPal.

According to Mr. Ahmed, eBay also offers a host of other services, from website design to fulfillment, which enables a small business to establish its own website and engage in global trade. He stated that eBay's cross-border trade is accelerating and accounts for 20 percent of its global gross merchandise volume and about 25 percent of PayPal's net payment volume. Mr. Ahmed explained that small businesses that have traditionally had little to no opportunity to engage in global trade can now use technology to access customers all around the world. He cited a study that found that over 95 percent of the commercial sellers on eBay engage in exporting and that on average, technology-enabled commercial sellers using eBay sell to 19 different countries. Mr. Ahmed also cited a World Economic Forum report that concluded that the use of technology platforms can reduce the burdens that small businesses face when trying to sell overseas and predicted that increasing cross-border platforms could increase sales across borders by small businesses between 60 to 80 percent. In addition, he cited an eBay study that concluded

[8] Edward Black, president and CEO, CCIA, posthearing submission to the USITC, March 22, 2013.
[9] USITC, hearing transcript, March 7, 2013, 206–214.

that consumers transacting on eBay experience 42 percent higher welfare gain in the form of increased real income when compared to trade over offline channels.

Mr. Ahmed said that there are steps that the government can take to make it easier for technology-enabled small businesses to continue to grow and thrive in the future, including improving delivery services; reducing customs complexity; innovating "trusted trader" programs, such as the customs and trade partnership against terrorism and the simplified entry initiative reduced logistical barriers for selected traders; and ensuring a free flow of data and no server requirements for all actors in the digital ecosystem. He also pointed out that the World Economic Forum report found that improvement in border administration, as well as transport and telecommunications infrastructure and services improvements, could trigger as much as 4.7 percent growth in global GDP.

Entertainment Software Association (ESA)[10]

In a written submission to the Commission, Mr. Stevan D. Mitchell, vice president of intellectual property policy at ESA, wrote that his association is exclusively dedicated to serving the business and public affairs needs of companies that publish computer and video games for video game consoles, personal computers (PCs), and the Internet. Mr. Mitchell stated that his written submission would (1) detail the industry's recent and steady increase in revenues derived from digital goods and services; (2) describe some of the factors contributing to the growth; and (3) highlight potential impediments to the U.S. video game industry's continued international expansion.

According to Mr. Mitchell, since 2009 U.S. digital sales of entertainment software have shown steady and dramatic growth. He noted that during that period, digital sales, including downloadable games, add-on downloadable content, online subscriptions, mobile apps, and casual browser-based games, have made up 20 percent of U.S. entertainment sales. Mr. Mitchell reported that since 2009, digital sales have steadily climbed and, in 2012, accounted for 40 percent of the industry's non-hardware sales, or nearly $6 billion in U.S. revenues. He said that his industry drives digital trade by leveraging the reach of a diverse set of hardware game-play platforms and online delivery mechanisms, such as dedicated home game consoles, handheld game consoles, PCs, and mobile devices, including tablets and smartphones. Mr. Mitchell stated that the expansion of digital sales of video games and related content is further driven by the myriad online channels through which customers can acquire and play games.

Mr. Mitchell stated that the video game industry's potential to increase global sales depends on a marketplace that is unencumbered by discriminatory regulations and is respectful and protective of intellectual property rights. Mr. Mitchell listed the most damaging impediments to U.S. exports of digital goods and services, including online fraud and piracy; regulatory measures that make it impractical for publishers to establish

[10] Stevan D. Mitchell, Vice President of Intellectual Property Policy, ESA, written submission to the USITC, March 7, 2013.

and maintain successful online presences; high tariffs and taxes on physical products that would otherwise facilitate digital sales; high hardware tariffs; excessive regulation; and closed generic top-level domains. [11]

Etsy[12]

In a written submission to the Commission, Etsy indicated that it is an online marketplace for handmade and vintage goods and supplies sold by artists, designers, and collectors around the world. According to Etsy, the lack of data on economic activities facilitated by digital services constitutes the biggest barrier to sensible policymaking, as it relates both to global trade and to economic development more broadly. The submission asserted that the U.S. government fails to capture the volume of digital trade, including how much offline trade is facilitated by digital services, and fails to define appropriate classifications for work enabled by these platforms.

Etsy noted that even without adequate government data, digital services like those offered by Etsy open up the global market to microentrepreneurs that face significant barriers to international trade. Customs and tax rules vary by country and, according to Etsy, credible information about each country's rules can be difficult to come by. Etsy's written submission supports efforts to reduce these burdens through the Low Value Shipment Modernization Act of 2013, which would rise the threshold exempting small transactions from customs and paperwork requirements and would support including a low-value customs exemption and standardization customs forms in future trade negotiations.

Etsy explained that while U.S. laws protect intermediaries from liability from the actions of their users, many countries lack similar protections for digital services. Etsy observed that protecting third-party platforms from liability for the actions of their users promotes innovation and the growth of international trade. Etsy recommended that the United States lead the way in negotiating international standards that simplify compliance and meet shared goals of protecting security, privacy, intellectual property, and consumers. In particular, Etsy indicated that it would benefit from the coordination of e-commerce policy between the European Union and the United States.

European Center for International Political Economy (ECIPE)[13]

In hearing testimony before the Commission, Mr. Hosuk Lee-Makiyama, director of the European Center for International Political Economy, focused his comments on the significance of data and how important it is for innovation, trade, and growth. He noted

[11] The core group of generic top level domains (gTLDs) consists of the .com, .info, .net, and .org domains the Internet Corporation for Assigned Names and Numbers (ICANN) manages domain names and addresses. There is a long-standing ongoing debate about increasing the number ofgTLDs. Karen E. Klein, "The Latest Domain-Name Gold Rush," *Bloomberg Businessweek*, June 4, 2012, http://www.businessweek.com/articles/2012-06-04/the-latest-domain-name-gold-rush.

[12] Etsy, written submission to the USITC, March 14, 2013.

[13] USITC, hearing transcript, March 7, 2013, 71–81.

that the Internet accounted for 21 percent of aggregate GDP growth across 13 of the world's largest economies during 2006–11. According to Mr. Lee-Makiyama, the equivalent figure for Brazil, China, India, and Russia is approximately 35 percent and in Sweden, it is 33 percent. The difference, according to Mr. Lee-Makiyama, is the size of the services market in each of these countries. He asserted that services accounts for only one-third of the China's GDP, whereas it makes up between 70 to 80 percent of the GDP for the EU and the United States. He also cited a study that found that about 50 percent of services trade is actually enabled by ICT services. Mr. Lee-Makiyama also noted that trade liberalization actually improved market access and promoted the development of supply chains in the digital economy.

Future of Privacy Forum[14]

In a written submission and in hearing testimony, Mr. Christopher Wolf, founder and co-chair of the Future of Privacy Forum, described his organization as a think tank committed to advancing privacy in business-practical ways. According to Mr. Wolf, digital trade in the U.S. and global economies can flourish only if there is adequate protection of data, especially personal data, and only if business and consumers can trust that data will be protected in the digital ecosystem. He stated that the privacy and security of personal data and respect for personal control of data must be paramount in the digital trade environment, but it is equally important to understand that duplicative or inconsistent regulation designed to provide the needed protections can serve as a drag on robust digital trade.

In his testimony, Mr. Wolf offered to set forth the current and proposed framework in the United States and the EU, two jurisdictions responsible for significant global digital trade, and suggested a focus for the Commission as it considers digital trade and the environment best suited to its endurance and growth. Mr. Wolf noted that digital trade is growing because technological advancements have made it easier and more cost effective for businesses to collect, use, share, and store vast amounts of personal information. Mr. Wolf also noted that the role that personal data plays in digital trade means that privacy increasingly is becoming an important issue. He stated that data rarely stays in only one jurisdiction as the Internet, social media, and cloud computing cross national borders, allowing data to be transmitted to any location in the world. He explained that privacy problems are not restricted to any one jurisdiction, which is causing policymakers to re-examine the legal frameworks that regulate the collection, use, sharing, and storing of personal information.

Mr. Wolf noted that the U.S. and EU have historically taken divergent approaches to implementing the underlying principles of fairness known as Fair Information Practice Principles. Mr. Wolf reported that privacy interests in the United States are balanced against the right to free expression and commerce, so that the legal framework assumes that not every piece of personal information can be protected and policed. According to Mr. Wolf, a major characteristic of U.S. privacy law comes from the targeted enforcement actions against bad (or negligent actors), principally by the U.S. Federal

[14] USITC, hearing transcript, March 7, 2013, 48–55; Wolf, written submission to the USITC, February 28, 2013.

Trade Commission. However, he indicated that the EU has a region-wide directive concerning privacy, with national laws in 27 jurisdictions to implement its requirements. He said that the directive, which purports to regulate every piece of personal information, is predicted on the notion that privacy is a fundamental human right. Mr. Wolf pointed out that policymakers in the EU believe that their framework is superior to that of the United States and that the U.S. does not have an across-the-board privacy law. Consequently, according to Mr. Wolf, data transfer from the EU to the U.S. is subject to expensive and burdensome legal mechanisms.

Mr. Wolf observed that there are proposals for changes to the privacy frameworks in both the EU and in the United States. He stated that the proposed EU general data protection regulation has many attributes that would ease the regulatory burdens on covered entities, as well as provisions embracing principles recognized in the U.S. as worthwhile, such as privacy by design and accountability. He said that nonetheless, many other provisions of the proposed regulations are anticipated to create substantially greater compliance obligations. In the United States, according to Mr. Wolf, the privacy framework also is under review. In 2012, the Obama Administration announced a Privacy Blueprint, calling for legislation containing a Consumer Private Bill of Rights and proposing enforceable codes of conduct developed through a so-called multi-stakeholder process.

Mr. Wolf recommended that the Commission pay close attention to the proposals for new privacy and data protection frameworks and consider the following issues: (1) finding ways to protect data and privacy without unnecessarily interfering with digital trade; (2) finding ways to evaluate proposals for new privacy frameworks in light of the goal of digital free trade; (3) noting when specific aspects of the proposal are likely to present impediments to digital free trade; (4) investigating how interoperability and mutual recognition of privacy and data protection frameworks be achieved; (5) examining the extent to which EU rules on the adequacy of other nations' privacy frameworks can act impede digital trade in circumstances where interoperability and mutual recognition are appropriate; and (6) investigating whether a new privacy paradigm should be embodied in free trade agreements.

IBM Corporation[15]

In a written submission and in hearing testimony, Mr. Steve Stewart, IBM's director of market access and trade, stated that his company is a globally integrated technology and consulting company operating in more than 170 countries and earning about two-thirds of its revenues outside the United States. Mr. Stewart noted that IBM develops and sells software and systems hardware and a broad range of infrastructure, cloud, and consulting services.

Mr. Stewart commented that digital trade represents an enormous opportunity for the United States, since U.S.-based firms have a comparative advantage in many aspects of the digital economy. He noted that U.S. firms are global leaders in ICT products and services that enable digital trade. The United States, according to Mr. Stewart, is the

[15] USITC, hearing transcript, March 7, 2013, 197–205; Stewart, written submission to the USITC, March 7, 2013.

world's leading exporter and services, and many services are increasingly being delivered electronically, given the rapid advances in technology. He also noted that one indicator of the growing potential for digital trade is the growth in the number of Internet users around the world. He pointed out that this growth presents a huge opportunity for U.S. companies and highlights the importance of addressing digital trade issues and trade agreements such as the Trans-Pacific Partnership, the International Services Agreement, and the Trans-Atlantic Trade and Investment Partnership.

Mr. Stewart listed four categories of online economic activities that can be counted as digital trade when these activities are conducted across borders: (1) electronically delivered services, (2) digital products, (3) e-commerce and physical goods, and (4) operations of global companies. He also identified several barriers to digital trade, including cross-border data restrictions; requirements that servers be sited locally; restrictions on access to markets for services; other regulations (behind-the-border barriers); and barriers to trade in ICT services and products. Mr. Stewart noted the absence of detailed statistics for the services sector. He stated that to correct this situation, a number of proposals to collect more granular data on services have been suggested, including company surveys conducted on a widespread basis across many sectors; reviews of company financial data and other readily available data; interviews with experts; data provided by industry trade associations; and private analyst reports.

Information Technology & Innovation Foundation (ITIF)[16]

In a written submission and in hearing testimony, Mr. Stephen Ezell, senior analyst for the ITIF, stated that the Internet accounted for 21 percent of the aggregate GDP growth across 13 of the world's largest economies from 2006 to 2011. He cited a World Bank estimate that ICTs accounted for one-quarter of GDP growth in the majority of developing countries during the first decade of the 21st century. According to Mr. Ezell, this growing digitization of the global economy is reflected in the expected quintupling of global Internet traffic between 2011 and 2015 and a 50 percent growth in annual cross-border trade.

Mr. Ezell noted that a growing number of countries are introducing anticompetitive practices in digital trade, including restrictions on the free flow of both data and ICT products and services. He also added that many of these practices take the form of localization barriers to trade (LBTs), which are designed to protect, favor, or stimulate one country's domestic industries, services providers, or intellectual property at the expense of those of other countries. He pointed out that LBTs include an array of practices, such as local-content requirements, restrictions on government procurement, and requirements that enterprises provide services using local facilities or infrastructure such as mandated local data storage or local processing of financial transactions as well as requirements to conduct duplicative conformity assessments of ICT products in-country. Mr. Ezell also noted that the WTO found that these types of LBTs and other nontariff barriers are twice as trade restrictive as traditional tariff barriers and account for the majority of trade barriers in place among countries today.

[16] USITC, hearing transcript, March 7, 2013, 24–32; Ezell, written submission to the USITC, March 14, 2013.

Mr. Ezell said that a number of countries have also introduced or are considering local data storage requirements or regulations affecting data security or data privacy that create geographic restrictions on places where corporation or ICT service providers can operate. He noted that Brunei, Greece, China, India, and Malaysia had passed explicit laws that require that data generated within the country be stored on servers located within the country. He added that a Vietnamese draft decree would require companies' Web search portals, data centers, and cloud computing services to be located in Vietnam and that a draft Indonesian law would require all data carriers to have a local data server/center in that country. Mr. Ezell noted that Norwegian and Danish data protection authorities had issued rulings to prevent the use of cloud computing services when the servers are not located domestically. He also noted that Russia, Nigeria, and Venezuela have passed regulations requiring that IT infrastructure for payment processing be located inside the country and Korea is now considering regulations that would require insurers and that other financial institutions to maintain servers for housing company financial data domestically and would restrict transfers of such data beyond Korea's borders.

Mr. Ezell observed that restrictions on cross-border flow of information places a wide range of U.S. companies at a disadvantage by decreasing their ability to distribute data over a diverse geographical region, a move intended to ensure redundancy and increase reliability. The restrictions also raise U.S. firms' cost to compete, since it may not be economically viable for a foreign competitor to build expensive new data centers in other countries. According to Mr. Ezell, not only do regulations requiring the localization of trade impact trade and digital data, but they are becoming increasingly prevalent with regard to trade in digital goods. He reported that India issued a preferential market-access mandate for electronic goods in February 2012 that imposed local-content requirements on the procurement of electronic products by the government or by private sector entities when there are security implications for the country. Likewise, Mr. Ezell reported that Brazil imposed restrictions on foreign enterprises' participation in the country's development of a 4G wireless telecommunications network, requiring that at least 60 percent of the equipment used be sourced locally. He also observed that an Indonesian decree requires at least 50 percent of the country's 4G wireless network infrastructure to be sourced locally by 2017.

Intellectual Property Alliance (IIPA)[17]

In a written submission and in hearing testimony, Mr. Michael Schlesinger, co-founder of IIPA, stated that his organization is a private sector coalition formed of trade associations representing U.S. copyright-based industries. He wrote that products and services dependent on copyright production make up a significant part of digital trade, including (1) products in digital formats and (2) products and services capable of being licensed, sold, distributed, or delivered over digital networks. He stated that the following products and services are relevant to digital trade: all types of computer software; entertainment software; motion pictures, television programming, DVDs and home video, and digital representations of audiovisual works; music, records, and CDs; books, education instructional and assessment materials, and journals; and databases.

[17] USITC, hearing transcript, March 7, 2013, 251–58; Schlesinger, written submission to the USITC, February 28, 2013.

Mr. Schlesinger identified a number of barriers to market access for digital trade, including overseas piracy; ownership and investment restrictions on copyright-related businesses; discriminatory content review/censorship systems; other discriminatory restrictions; the maintenance of quotas, including screen time and broadcast quotas or complete bans on broadcast of foreign programming or advertising; periods when U.S. producers are prohibited from releasing or are forced to release their films in theaters; restrictions on the window for theatrical exhibition/distribution; local film print requirements; import duties or improper assessment of duties ad valorem; government procurement preferences for domestic products or those with locally owned or locally developed intellectual property; and hardware tariffs.

Mr. Schlesinger cited findings from a study by Stephen Siwek of Economics, Inc., that found that U.S. "core" copyright-based industries accounted for an estimated $931.8 billion in 2010; or 6.3 percent of U.S. GDP. The study also found that the total value added of copyright industries that year was $1.6 trillion or 11.1 percent of U.S. GDP. It also estimated that 2010 foreign sales and exports of key sectors amounted to $134 billion. He also cited a study from BASAP that estimated the value of digitally pirated music, movies, and software (not losses) at $30–$75 billion in 2010, predicting that it would grow to $80–$240 billion by 2015. The study estimated that 42 percent of all software used worldwide is unlicensed, with the commercial value of unlicensed software rising to more than $63 billion worldwide. He concluded by observing that the Special 301 trade program is the one mechanism used by the United States to identify barriers and impediments to trade and copyrighted materials. Over the years, according to Mr. Schlesinger, the IIPA has filed in all 25 Special 301 proceedings.

Joshua Meltzer, Fellow, Global Economy and Development, the Brookings Institution[18]

In a written submission and in hearing testimony, Mr. Joshua Meltzer, a fellow in global economy and development at the Brookings Institution, noted that the Internet has become a key platform for international trade in the 21st century. Mr. Meltzer observed that the Internet-based trade has the potential to produce sizable economic gains for developing country exporters, as it helps them overcome some of the domestic impediments to reaching global markets, such as poor infrastructure and inefficient customs procedures. He stated that likewise, cross-border flows of information are increasingly providing a vast range of economic opportunities that if realized will drive innovation, invention, and productive growth. Mr. Meltzer added that governments are increasingly intervening in the operation of the Internet in order to address challenges such as cybercrime and ensuring data privacy.

In his written submission, Mr. Meltzer focused on the importance of the Internet and cross-border data flows for international trade. He observed that the original and essentially libertarian nature of the Internet is increasingly being challenged by government assertions of jurisdiction over the Internet or by their development of rules that restrict the ability of individuals and companies to access the Internet and move data

[18] USITC, hearing transcript, March 7, 2013, 32–39; Meltzer, written submission to the USITC, February 25, 2013.

across borders. According to Mr. Meltzer, in some cases, governments are motivated to interfere in the Internet to respond to concerns about morality, national security, and intellectual property protection; to impose commercial restrictions; and to advocate particular political views. He observed that governments like China, Iran, and Burma have increasingly filtered and blocked access to media and blogs that advocate political views that the governments disagree with.

Mr. Meltzer stated that ensuring adequate protection of personal electronic data across borders is a key concern of governments, which has implications for firms' ability to transmit and send information across borders. One issue, according to Mr. Meltzer, is that countries take different approaches to protecting privacy and to exporting consumer data. He explained that Australia, for example, allows data to be exported to jurisdictions with substantially similar levels of data privacy protection. He also stated that the U.S. Federal Trade Commission has developed a privacy framework which companies that collect and use data are expected to follow, combined with enforcement action for companies that fail to comply. Mr. Meltzer noted that data protection laws in the EU prevent the export of data to countries with lower-level data privacy laws.

Mr. Meltzer pointed out that international trade policy and law has been alert to the potential for e-commerce since the WTO began to take shape, but it is clear that in the early 1990s, when the WTO agreements were being finalized, there was only a limited awareness of the transformative impact the Internet was going to have on international trade. He commented that WTO rules were largely designed for a world where international trade was in physical goods and services delivered in person. He also noted that the broader range of cross-border movements of data that indirectly affect international trade has yet to be a focus of trade policy or law in many countries. Mr. Meltzer indicated that the impact of the Internet and cross-border data flows on international trade calls for a more comprehensive development of trade policy and law that can underpin and support the transformative impact of Internet access and cross-border data flows on international trade. The key challenge going forward, according to Mr. Meltzer, is going to be maintaining as much as possible of the open nature of the Internet by limiting government intervention.

Motion Picture Association of America (MPAA)[19]

In a written submission and in hearing testimony, Mr. Greg Frazier, executive vice president of the Motion Picture Association of America (MPAA), stated that his association represents six of the world's largest producers and distributors of theatrical motion pictures, home entertainment, and television programing. Mr. Frazier stated that the U.S. film industry is becoming increasingly digitized and will become more dependent on exports in the future. Mr. Frazier noted that U.S. film and television industry generates a positive balance of trade in every country where it does business.

Mr. Frazier added that the most immediate and most pernicious threat to the digital audiovisual sector is the theft of content. He cited a Sandvine report that estimated that approximately 12 percent of all Internet traffic is files haring—that is, content passing

[19] USITC, hearing transcript, March 7, 2013, 238–43; Frazier, written submission to the USITC, March 7, 2013.

over the Internet without the authorization of the creator. Mr. Frazier noted that policymakers cannot address digital trade without addressing the theft of digitized products. He also listed market access barriers faced by his members, including quotas, local-content requirements, restrictions on growth in overseas markets, and governments seeking to impose on the digital market restrictive policies taken from the analog market.

Mr. Frazier observed that the continued growth in U.S. digital trade, underpinned by the explosive growth in online audiovisual usage, will be hobbled unless these problems are corrected. He commented that if all the relevant players, including the private sector and government, combine their efforts to combat online infringement, the legitimate marketplace for cultural products will thrive. He stated, however, that he believes that anything less than full cooperation and the observance of the rule of law risks precipitating a steady decline in U.S. investment in cultural products.

National Music Publishers' Association (NMPA)[20]

In a written submission to the Commission, Mr. Jay Rosenthal, senior vice president and general counsel for the NMPA, stated that the association is the principal trade association representing the interests of U.S. music publishers. He expressed support for the position taken by the NMPA and the International Intellectual Property Alliance (IIPA) endorsing a broader definition of "digital trade" than only encompassing "commerce in products and services delivered over digital networks." Mr. Rosenthal observed that the digital world is constantly expanding, and that a broader definition is necessary to capture this expansion. Any definition of digital trade, according to Mr. Rosenthal, should be broad enough to capture not only products delivered over digital networks, but also products that are available in digitized formats. Mr. Rosenthal also endorsed the positions of the Recording Industry Association of America and the IIPA, stating that an international commitment to enforcing copyright protection and continued efforts to eradicate piracy are necessary to maintain a thriving digital trade for the music industry. Mr. Rosenthal noted that the problems created by the lack of effective copyright enforcement are felt especially profoundly in the music industry by songwriters.

Progressive Economy[21]

In testimony at the Commission's hearing, Mr. Ed Gresser, director of the GlobalWorks Foundation at Progressive Economy, described his organization as a think tank that develops ideas and practical public policy solutions for trade and globalization. He pointed out that the digital world is very new, as it is still less than 20 years since the launch of the WorldWide Web and barely 10 years since the creation of the global fiber optic network. Mr. Gresser compared the impact of cross-border digital trade to the influence of container shipping in the early 1960s.

[20] Jay Rosenthal, senior vice president and general counsel, NMPA, written submission to the USITC, February 28, 2013.

[21] USITC, hearing transcript, March 7, 2013, 16–24.

Mr. Gresser stated that it is difficult to know what influence the Internet will have in the future and remarked that there are no official statistics on digital trade. Mr. Gresser described the approach he used in a paper he wrote in 2011 in which he attempted to assess industry trends and the scale of digital trade. He noted that the paper used surrogate statistics for Internet trade from the Commerce Department's report on services trade, the Census Bureau's annual e-commerce report, and the USITC's Data Web. Mr. Gresser explained that his paper concentrated on industries considered to be well suited to Internet trade, including financial services, insurance, telecommunications, and business and professional services.

Mr. Gresser noted that in 1990 the service industries accounted for nearly $15 billion in exports, or 2.8 percent of total goods and services exports. By 2000, according to Mr. Gresser, those figures had grown to $80 billion, or approximately 7.6 percent of total goods and services exports. He also noted that these industries are expected to account for about $240 billion I n2013, or nearly 12 percent of total exports. Mr. Gresser noted that these industries are well suited to digital trade and their share of both total exports and total imports is growing.

Mr. Gresser observed that the WorldWide Web became operational during the same time frame as the WTO's General Agreement on Trade and Services was being implemented. However, he noted that there are only two WTO agreements covering services and that even fewer include stated e-commerce provisions, except for those negotiated in accession agreements. He stated that this suggests that digital trade offers countries a great deal of latitude for (1) arbitrary protectionism, especially via local data hosting requirements under which governments mandate that foreign firms use local infrastructure to operate locally, and (2) government content review and censorship. Mr. Gresser pointed out that these issues are quite difficult to guard against through the WTO.

Mr. Gresser observed that the current administration is beginning to integrate services industry issues into free trade agreements (FTAs), and he believes that U.S.-EU FTA talks and the TPP could represent an opportunity to set down principles and ideas that may lead to the creation of a WTO services agreement comparable to the General Agreement on Tariffs and Trade (GATT) for goods. Such an agreement, according to Mr. Gresser, would create a presumption that data should be able to move freely across borders, that WTO members would accept negotiated limits on market access for services, and that qualified professionals and providers could use the Internet to export. He said he believes that the administration has done a good job in trying to develop consensus at the OECD and in working with U.S. FTA trading partners on these matters.

Lastly, Mr. Gresser stated that it is very difficult to evaluate or make policy without appropriate data. Without knowing how trade flows and investment respond to new agreements or new commitments, according to Mr. Gresser, negotiators are making policy based on economic theory, intuition, or the advice of experts and other interested parties.

Progressive Policy Institute (PPI)[22]

In a written submission and in hearing testimony, Dr. Michael Mandel, the PPI's chief economic strategist, stated that cross-border data flows are becoming increasingly critical as a topic in the trade negotiations announced by the U.S. Trade Representative in January 2013. Similarly, he indicated that the European Union is considering new data privacy regulations that would impact flows of data in and out of the EU. He commented nonetheless that statistics about the magnitude of cross-border data flows are scarce, despite their growing economic and political importance. Mr. Mandel noted that companies like WalMart are closely connected via bandwidth data pipes with their affiliates and suppliers in other countries. Likewise, he pointed out that financial traders are doing transactions around the clock in every corner of the globe.

Mr. Mandel cited a report by the U.S. Census Bureau and the Bureau of Economic Analysis (BEA) that contains data on telecommunications services imports and exports, but he asserted that the report likely misses much of the increase in cross-border data traffic because of fundamental changes in the structure of global networks. He also said that the usual categories of exports and imports do not appear to apply to cross-border data flows, since it is not clear that an outflow of data from a country should count as an export. Mr. Mandel noted that long-established conventions treat outgoing international phone calls as imports, even though both the originating network and the receiving network play an equal role in the call.

In a post-hearing submission, Mr. Mandel expressed the view that the Commission's initial definition of "digital trade" is too broad, stating that it does not parallel the definitions of trade in goods and services and that by focusing on "commerce in products and services," the Commission perhaps unintentionally pays less attention to the exceptionally large quantity of cross-border data flows that are economically important, but do not leave a direct monetary footprint.[23] He cited a BEA report that defined U.S. international services as "cross-border trade in services—that is, exports and imports in the conventional sense—as well as services supplied to international markets through the channel of direct investment by affiliates of multinational companies."

Mr. Mandel offered an alternative definition of digital trade: "cross-border data flows and the products and services that significantly depend on cross-border data flows." He noted that his definition had several advantages: it places the focus of digital trade squarely on all cross-border data flows; it parallels the definitions of trade for goods and services; the term "significantly" indicates an interest in those products and services that are data-intensive, such as financial services; and this definition does not require a direct monetary footprint from the trade. Most importantly, according to Mr. Mandel, his definition would be easy for the Commission to apply.

[22]USITC, hearing transcript, March 7, 2013, 32–39; Mandel, written submission to the USITC, March 14, 2013.

[23] Dr. Michael Mandel, chief economic strategist, Progressive Policy Institute, post-hearing submission to the USITC, March 22, 2013.

Recording Industry Association of America (RIAA)[24]

In a written submission and in hearing testimony, Mr. David Glazier, the RIAA's senior executive vice president, stated that his association represents America's record companies, which create, manufacture, and distribute approximately 85 percent of the legitimate recorded music produced and sold in the United States which claim a major share of music distributed in global markets. The music industry, according to Mr. Glazier, is now primarily a digital business, and more than half of its revenues come from digital sources.

Mr. Glazier noted that much has changed in the digital marketplace for creative works in the past couple of years, with the most striking development being the accelerating proliferation of new digital services for the authorized dissemination of recorded music. Mr. Glazier stated that the music industry is making far more content available through far more authorized digital services than ever before. However, he noted that online infringement continues, undercutting legitimate services and thereby harming investors in content production and cheating law-abiding customers. He also said that despite marketplace and government efforts against copyright theft, many avenues remain that enable profiteering from infringement.

Mr. Glazier said that the U.S. government should play a critical role in facilitating and encouraging inter-industry cooperation and ensuring that U.S. trading partners provide adequate and effective protection of intellectual property. He noted that over the last two years, a number of large-scale sites and services dedicated to online infringement have been shut down as a result of advocacy by USTR and by enforcement efforts of the Departments of Justice and Homeland Security. He noted that the Commission's investigation may shine a light on practices that undermine U.S. competitiveness and employment. Mr. Glazier also noted that the United Kingdom, France, and other countries have been taking steps to address anticompetitive practices, but new methods for operating illegal services have emerged at a rapid pace and that the level of theft eclipses the legitimate sector in many countries such as China and Russia.

Software & Information Industry Association (SIIA)[25]

In a written submission and in hearing testimony to the Commission, Mr. David LeDuc, Sthe SIIA's senior director for public policy, stated that the association is the principal trade association for the software and digital information industry. In his testimony, Mr. LeDuc offered five major points regarding digital trade: (1) barriers to cross-border digital trade hurt both U.S. exporters and the countries that are maintaining these barriers; (2) intellectual property protection is a critical element in making digital trade possible; (3) digital trade is an increasingly important part of U.S. exports; (4) the export activity in the software and information services market is an increasingly important part of U.S. trade in services; and (5) new trade agreements, such as the Trans-Pacific Partnership

[24] USITC, hearing transcript, March 7, 2013, 244–51; Glazier, written submission to the USITC, February 28, 2013.

[25] USITC, hearing transcript, March 7, 2013, 230–38; LeDuc, written submission to the USITC, March 14, 2013.

(TPP) and International Services Agreement, should focus on making sure that digital products, regardless of their classification as a good or service, receive market access, national treatment, most-favored-nation treatment, and other benefits of open markets.

Mr. LeDuc said that the SIIA supports proposals being considered in the TPP negotiations that address barriers to the cross-border flow of data and seek the abolition of mandates that require servers to be located in every country in which companies do business. These proposals, according to Mr. LeDuc, are necessary for businesses to harness the full benefits of the Internet and a global 21st century economy that relies upon the unfettered cross-border flow of information and data.

Mr. LeDuc made a number of points about the ways countries benefit from lowering barriers to trade in digital services, including:

- Unimpeded flow of digital commerce is a precondition for enhancing domestic economic performance.

- Domestic productivity increases when firms are able to import the best computing and information services at the lowest prices.

- Online information services, Internet-based services, and computer services supply strategically important inputs for all sectors, goods, and services.

- A country that wants to excel in the provision of banking and financial, education, tourism, construction, and healthcare services needs to allow its businesses and citizens to obtain the best possible inputs from information and computer service providers regardless of location.

- Worldwide suppliers of online and computer services provide the spur of competition to ensure that all service sectors excel. These suppliers help domestic exporting and manufacturing companies.

- Having a seamless flow of information and a flexible location of servers leads to increased price competition, better quality, and wider choice for consumers.

- Lower prices and a wider availability of information services and computer services lead to greater product and process innovation throughout a domestic economy.

- Proposals to lower barriers, if adopted, would provide producers, investors, workers, and users with a clear idea of the rules of the game, thereby encouraging long-term investment and commitment to local markets.

Mr. LeDuc noted that the protection and effective enforcement of intellectual property rights is critically important to the economic growth and prosperity of all fast-growing economies and to the innovative software and digital content companies that rely on copyright, patent, trademark, and trade secret protection to secure investments in their valuable innovations. He also noted that it is essential that U.S. trade policy seek high standards for the protection and enforcement of the intellectual property rights that reside in software and digital content. Mr. LeDuc observed that history has shown that laws

affording strong copyright and patent protection for software and digital content, coupled with effective enforcement tools, are (1) a precondition for large-scale investment by worldwide content and software companies, since these companies focus their investment in countries where they are confident they can protect the integrity of the products and services they offer; and (2) a necessary ingredient for the successful growth of indigenous software and content companies, since their sustained growth can take place only when the local and foreign distribution of these products and services is secure.

Mr. LeDuc recommended that the Commission's proposed definition of digital trade be amended to sufficiently capture digital networks. He urged the Commission to focus on the market segments of software and information-based services including those cited in a 2011 BRS study encompassing communications services, insurance, financial services, computer and information services, royalties and license fees, other business services, and personal, cultural, and recreational services.

APPENDIX E
Overview of the Internet Communications Infrastructure

The Internet: Interconnected Networks

The Internet is not a single network but instead a collection of millions of individual networks located across the globe. These individual networks—referred to as local networks—are the basic building blocks of the Internet and include the networks of private companies, government agencies, universities, and other organizations.[1] Such local networks are connected to the Internet by local Internet service providers (ISPs),[2] usually via copper wire or fiber optic cables running from individual homes and buildings to the ISP's networking computers, often housed in the local central offices of incumbent telecommunications companies. In turn, these local ISPs connect to the broader Internet via leased (or owned) fiber optic cables running from local telecommunications central offices to the closest Internet exchange point (IXP). IXP facilities, which are located in or near virtually all major cities and urban conurbations worldwide, as well as many medium and small cities, run the gamut from large nondescript, warehouse-like buildings in suburban areas to floors or suites in high-rise buildings in downtown locations.

Inside an IXP, a wide variety of telecommunications companies, ISPs, content providers (like Facebook or Google), and other telecommunication network companies lease space, install routers and other networking equipment, and connect to other occupants in the facility.[3] To avoid conflicts of interest and commercial discrimination, most IXPs are "carrier-neutral," meaning that they are owned by private companies that specialize in offering space for networking equipment as well as associated services like power supply, air conditioning, and physical security. One of the world's largest and most important IXPs, which is operated by Equinix, a specialty provider of IXP facilities, is located in Ashburn, VA. Although Equinix does not disclose customer identities, several hundred carriers, ISPs, content providers, and other communications network companies maintain routers and other networking equipment at Equinix's Ashburn facility.[4] Other leading IXPs include the Palo Alto Internet Exchange (Palo Alto, CA); the Japan Internet Access Point (Tokyo, Japan); the Deutscher Commercial Internet Exchange (Frankfurt, Germany); London Internet Exchange (London, England), and the Amsterdam Internet Exchange (Amsterdam, Netherlands). Rural areas or medium-sized cities in the United States often form regional IXPs, like the Midwest Internet Cooperative Exchange (Minneapolis, MN) or the Yellowstone Regional Internet Exchange (Billings, MT), which link seven rural networks in Montana and Wyoming.[5] The vast majority of IXPs worldwide, however, are actually small, unknown local facilities, often run as cooperative side projects by network engineers working for local ISPs, telecommunication carriers, and other network companies.[6]

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[1] Gralla, *How the Internet Works*, 7. Individual devices like tablets, personal computers, and mobile phones become part of a network by establishing a connection to an Internet service provider.

[2] An Internet service provider (ISP) is a company that provides a connection to the Internet; ISPs can range from large, multinational telecommunications companies to small, local companies that focus on providing Internet access services.

[3] As a general rule, requests to interconnect take place upon invitation, although in rare instances invitations are declined. In practical terms, companies within an IXP facility connect to each other by running a fiber optic cable from the requestor's router, across the IXP facility through floor or ceiling passageways, to the requestee's router. Blum, *Tubes, 131.*

[4] Ibid., 90-92, 117.

[5] Ibid., 111–112.

[6] Ibid., 111–112.

Individual IXP facilities connect to other IXP facilities located in the United States and across the world via so-called "backbone" networks.[7] Backbone networks consist of hundreds of strands of fiber optic cable strung through plastic tubes, referred to as ducts, that run between major cities along established rights-of-way, including roads and highways, railroad lines, and power lines. Many IXP facilities are located on backbone network paths due to first mover advantages and/or the size and importance of their facilities, although the vast majority of IXPs have to connect to backbone networks by installing fiber optic cables from their facilities to backbone-connected IXPs.

Although the development of intra-city backbone networks started in the early 1990s, a sharp acceleration of construction activity occurred in the late 1990s and early 2000s. During this period, a wide variety of telecommunication carriers, global ISPs, and specialty wholesale network companies installed fiber optic backbone cabling between most major cities in the United States and many Western European countries, often establishing competing backbone networks along identical paths.[8] During this period, a large number of submarine cables were also installed between major cities bordering the Atlantic and Pacific Oceans (figure E.1).[9] Submarine cables, which consist of several strands of fiber optic cable surrounded by a rubber, water-proof protective covering, are laid on the ocean floor, stretching from a coastal landing station in one country across the ocean floor to a coastal landing station in another country;[10] coastal landing stations are ultimately connected to IXPs, typically located in major cities, via long-distance fiber optic cable infrastructure referred to as backhaul.[11]

[7] Tyson, "How Internet Infrastructure Works," [2004] (accessed April 22, 2013); Blum, *Tubes*, *55–6*.

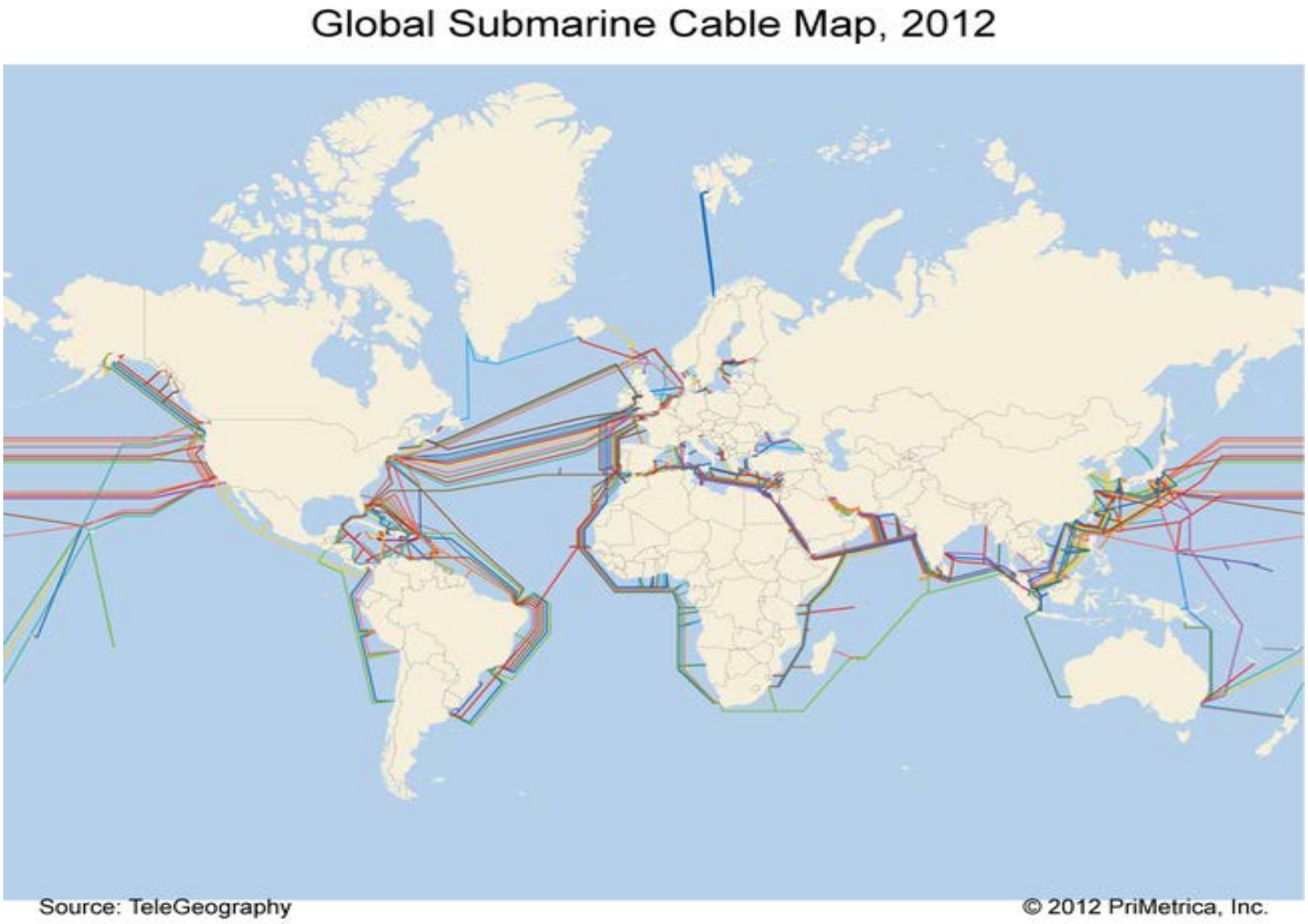
[8] Blum, *Tubes*, 55–6.

[9] A large number of submarine cables were also installed from the United States to England and Japan. During the past decade, extensive submarine cable networks have been installed between Asian countries and, to a lesser extent, around Africa and Latin America. A large number of cables also run from the United Kingdom, through the Mediterranean Sea and Suez Canal, and across the Indian Ocean to major countries in Asia. TeleGeography, *2012 Submarine Cable Map*, 2012.

[10] For example, a large number of submarine cables running between the United States and Europe originate in landing stations located on Long Island, New York, running across the ocean bed in the north Atlantic Ocean to landing stations located in Cornwall, England. Blum, *Tubes*, 191–226.

[11] For example, in the United States, backhaul infrastructure for most transatlantic submarine cables runs from landing stations on Long Island, New York to 60 Hudson Street in downtown Manhattan. Conversely, in the United Kingdom, backhaul infrastructure from landing stations in Cornwall runs several hundred miles to Telehouse, a telecommunications hub located in the Docklands area of London, England. Ibid., 183.

FIGURE E.1 Global submarine cable network



Source: TeleGeography, http://www/telegeography.com.

Internet Technologies

The Internet works on a so-called client/server model. Under the client/server model, one computer, the client, initiates contact with and requests information from another computer, the server.[12] When an individual downloads a webpage, for example, the client is the Internet browser on their personal computer, laptop, or tablet, whereas the server is typically a large, powerful computer that is specifically designed to store data and deliver it to client computers upon request.

The networks that comprise the Internet are digital networks, meaning that data flowing over them is broken down into "bits," which are expressed as either a 0 or 1. Bits are assembled into groups of eight (a byte) which, are expressed as either a 0 or a 1. Bits are transmitted through the glass fibers that comprise much of the Internet by lasers, referred to as laser diodes, contained in routers and other networking equipment. Laser diodes, which transmit bits in a sequence of time slots, represent a "1" with a pulse of light in a time slot, whereas a "0" is represented as the absence of a pulse.[13] In electrical networks, like the copper wires and coaxial cables that make up much of the local Internet access infrastructure, "1" bits are represented as high voltage, whereas "0" bits are represented as low voltage.[14]

The electrical and fiber optic infrastructure that connects client and host computers across the Internet are based upon packet-switching technologies.[15] In a packet-switched network, information (like an email or webpage) is broken down into virtual "packets" at the originating computer, sent over the Internet's fiber optic infrastructure, and reassembled at the destination computer.[16] Such packets are created and routed with software that uses two computer language protocols: Transmission Control Protocol (TCP) and Internet Protocol (IP). In simple terms, TCP breaks down (and reassembles) packets whereas IP ensures that the packets reach their intended destination.[17] Individual packets typically travel across the Internet from client to host computers via a series of routers. Routers, which are large, specialized computers located in IXPs worldwide, examine individual packets; determine each packet's destination; calculate the fastest, most efficient route across the network; and then forward each packet to another router closer to its ultimate destination. As a result of this process, packets hop from router to router across the Internet until they reach their end point. In many cases, packets associated with a particular transmission travel via different paths and, due to factors like network congestion, may arrive at the destination computer out of order.[18]

Most common Internet activities such as downloading a Web page, sending an email, or making a telephone call using Voice over Internet Protocol (VoIP) services are transmitted over the Internet in exactly the same way. When an individual creates and

[12] Tyson, "How Internet Infrastructure Works" [2004] (accessed April 22, 2013); Gralla, *How the Internet Works*, 2007.

[13] Goleniewski, Telecommunication Essentials, 2007, 75–6.

[14] Ibid., 19.

[15] By contrast, the traditional telephone network is circuit-switched, which means that a dedicated circuit connecting the caller to the receiver is established for the duration of the telephone call. Ibid., 87.

[16] Intel, "The Internet," n.d. (access April 22, 2013);

[17] Gralla, *How the Internet Works*, 2007.

[18] Blum, *Tubes*, 2012, 29–30; Gralla, *How the Internet Works*, 2007, 39–41.

sends an email, for example, email software uses the TCP protocol to break the message into packets, the IP protocol tags each packet with addressing information, and the packets are streamed (through an email server) into the Internet network. On the network, routers examine packet addresses and forward packets to other routers closer to each packet's final destination. Packets are forwarded from router to router across the Internet infrastructure until they arrive at the mail server that houses the recipient's email account, whereupon the TCP protocol assembles the message. When the recipient accesses their email account, the message is downloaded from the mail server to the recipient's email software.[19] Similarly, when downloading a Web page, the browser on a user's computer sends a request for the Web page as a series of packets, which travel across the Internet to the server hosting the requested website. After processing the browser's request, the server breaks the Web page into packets, sending them across the Internet to the user's browser, where they are reassembled into a complete Web page. Services like Skype or Vonage, which use VoIP technologies to make calls over the Internet, work exactly the same way: VoIP software breaks voice signals into packets which are routed over the Internet and reassembled into voice signals at the far end.[20]

Connecting to the Internet

Although individuals can connect to the Internet via a variety of technologies, the most common methods include company networks in the workplace, digital subscriber line and cable television services at home, or wireless fidelity services in public venues ranging from the public library to Starbucks. Over the past five or six years, the ever-greater penetration of smartphones and high-speed mobile networks has led to a surge of people accessing the Internet using mobile telephones.

DSL Services

Although office parks and residential communities built in the past 10 to 15 years tend to be connected to local telephone networks via fiber optic cables, a very large share of homes and businesses worldwide are still served primarily by copper telephone wires that were installed in the early 20th century. Due to the prevalence of such legacy telecommunications networks in many countries, DSL services have experienced a surge in usage over the past few years, largely because DSL services are capable of delivering high-speed Internet services over traditional, copper-based infrastructure. Since traditional telephone calls use only a small part of the potential bandwidth[21] offered by copper telephone lines, DSL services use modulation techniques to establish three types of signals, or channels, one each for sending and receiving Internet data and one for traditional telephone calls. For this reason, DSL users are able to talk on the phone and use the Internet simultaneously. DSL services are established by installing hardware referred to as DSL modems in the home (or business) as well as the telephone company's central office, although the nature of DSL technology requires these modems to be placed within a limited distance. Although the required spacing varies by type and speed of DSL

[19] Gralla, *How The Internet Works*, 2007, 89–91

[20] Ibid., 120–125.

[21] Bandwidth measures the number of bits that can travel through a communication channel during one second, or bits per second (bps). A standard DSL connection, for example, can download data at a rate of more than 1 million bits per second (mbps). Intel, "The Internet," n.d. (accessed April 22, 2013); Verizion Web site, http://www22.verizon.com/home/highspeedinternet/high-speed-internet-plans/#plans (accessed April 23, 2013).

service, not to mention the gauge of installed copper wire, higher speed services tend to require closer proximity to the telephone company's central office.[22]

Cable Television Services

Due to the steady adoption of cable television services from the late 1970s onwards, millions of houses in the United States (and other countries) are connected into an existing cable television network infrastructure, particularly in urban areas. Starting in the late 1990s and early 2000s, cable TV companies started to offer high-speed Internet services over the same infrastructure used to provide cable TV services. At the local neighborhood level, cable television infrastructure consists of coaxial cables which run from most homes within a specified service area, often a grouping of 500 homes, to a neighborhood node. Inside each home, the coaxial cable is divided into two separate cables by a splitter, with one cable running to the traditional cable television set-top box and the other cable connected to a cable modem which, in turn, is connected to a network card found on virtually all personal computers. Neighborhood nodes are connected by high-speed fiber optic lines to regional cable company facilities referred to as head ends, with each head end serving up to ten towns. The head end, which is responsible for providing Internet access and television content to cable company customers, receives television signals from onsite satellite base stations and is connected to the broader Internet infrastructure by high-speed, fiber optic lines.[23]

Wireless Fidelity

Wireless Internet access in hotels, airports, coffee shops, and other businesses began to emerge in the early- to mid-2000s. Currently, the most common way to provide wireless Internet services is via a family of technological standards called 802.11, also known as wireless fidelity, or simply Wi-Fi. The main component of a Wi-Fi network is a base station, often called an access point or router, which consists of a radio transmitter and receiver as well as a connection to the Internet. Laptops, tablets, and other wireless devices connect to the base station via an internal wireless network card. In WiFi terminology, each device connected to the base station is referred to as a station. When a station is activated, it scans the immediate vicinity for a base station by sending out a connection request and waits for a response. If a station detects more than one base station, it selects the most robust connection based upon signal strength and error rates. After a series of short, back and forth request and acknowledgment transmissions between the station and the access point, a connection is established and the station can transmit and receive Internet packets through the access point to/from the broader Internet.[24]

Mobile Telephones

Broad-based usage of mobile telephones to access the Internet started, more or less, with the introduction of Apple's iPhone in 2007. Over the next 2–5 years, the introduction of competing smartphone brands and the relentless development of high-speed network

[22] Gralla, *How the Internet Works*, 2007, 54–5.
[23] Ibid., 58–9.
[24] Ibid., 72–3.

infrastructure by telecommunication companies have made mobile phone access to the Internet increasingly ubiquitous. To establish a connection to the Internet, a mobile phone first emits radio waves, scanning its immediate vicinity to find a base station. A base station is a structure (typically a radio mast or tower) that houses antennas, transmitters and receivers, control equipment, digital processing equipment, and power equipment. Depending upon its location, the cell phone chooses the base station that emits the strongest signal and establishes a radio wave connection to the tower. When a mobile phone user attempts to access a Web page (or conduct other activities on the Internet), the phone's request is transmitted across the radio wave connection to the base station. The request is processed by the base station's equipment, routed through a high-speed, fiber optic land-line to the nearest Internet access point, and forwarded across the Internet to the server housing the requested information. After the server processes the request, the information is sent across the Internet to the original base station and across the radio wave to the cell phone.[25]

[25] Ibid., 68–9.

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APPENDIX F
Competitive Rationales for Adopting Internet Technologies in Various Industry Sectors

Competitive Rationales for Adopting Internet Technologies in Various Industry Sectors

Apart from the information sector, certain sectors such as retail services, manufacturing, financial services, professional services, and healthcare are ranked across the various measures of digital intensity; firms in these sectors are adopting digital technologies in order to lower costs, increase efficiency, offer products and services through a variety of channels, and improve customer interactions. They use Internet networks to help monitor and improve their service delivery and production processes. They also find Internet connectivity to be an important tool for reaching and interacting with customers. Examples of industries responding to these competitive rationales for adopting Internet technologies are detailed in tables F.1 and F.2.

A variety of Internet technologies help firms lower costs and become more efficient. These resources include location-based tracking; online ordering and other types of business-to-business (B2B) and business-to-consumer (B2C) e-commerce; wireless machine-to-machine (M2M) communications; Big Data analytics; and all aspects of cloud computing, including software-as-a-service (SaaS), infrastructure-as-a-service (IaaS), and platform-as-a-service (PaaS) services (see table F.1).

Convenience and efficiencies are achieved on the demand side also. Consumers are able to access products and services at any time through online or mobile Internet connections, as well as through more traditional channels (in-store or by telephone). At the same time, Internet technologies, including cloud computing, search engines, and social media, allow firms and consumers to benefit from better and more frequent interactions (see table F.2). According to a detailed analysis of digital trade from Capgemini and the MIT Center for Digital Business, the banking and retail sectors, as well as high-tech manufacturing, have moved furthest toward incorporating digital technologies throughout their businesses. In the process, they have enhanced customer engagement and improved their capacity for analyzing sales trends.

TABLE F.1 Competitive rationales for adoption of Internet technologies: Examples of how Internet technologies enable firms to lower costs and improve efficiency

Benefits of Internet technologies	Sectors	Examples of specific technologies employed
1. Efficient logistics enable firms to globalize their supply chains and increase e-commerce sales.	Manufacturing B2B e-commerce	SaaS supply chain management systems are used to verify quality, cost, and schedule of purchased components.[a]
	Retail trade	Growth in e-commerce requires a delivery mechanism for goods purchased online. Express delivery services firms are seeing growth in B2C deliveries and use digital tracking and monitoring for this segment as well as the B2B segment.[b]
	Transportation and warehousing	Firms increasingly use transportation management systems, such as SaaS asset tracking systems that allow data logging, satellite positioning, and data communication to back office.[c]
	Wholesale trade and distribution	Logistics providers use predictive Big Data analytics to optimize maintenance and repair of their vehicle fleets.[d]
2. Cloud computing can help make production and supply chain management more efficient.	Manufacturing	Data processing and storage systems for quality control testing and parts inventory management.[e]
	Manufacturing and assembly	An industrial supply chain may be financed more cheaply with a cloud computing system. Companies seeking trade financing for inputs can arrange financing on a trade-by-trade basis rather than on a program basis, thereby better integrating finance into their supply chain management systems.[f]
	Retail trade	Retailers are using PaaS cloud services for e-commerce applications to smooth out the surges in demand due to holiday shopping.[g]
	Various industries	SaaS services help firms manage their customer relationships and other business processes.[h]
3. Big Data analytics and the Internet of Things combine to enable more efficient management of resources.	Architecture, engineering and construction services	Building information modeling programs create virtual architectural models and assist in planning for construction, maintenance, and demolition.[i]
	Buildings and property management	"Smart" building management with security systems and energy management systems rely on Internet-connected cameras and sensors.[j]
	Manufacturing	Modeling machine sensor data from the factory floor optimizes marterials and energy use in manufacturing. Sensors in production lines take readings on process conditions to prompt adjustments to reduce waste, downtime, and human interventions. Big Data analytic tools are used in semiconductor manufacturing, for example, to calibrate and match critical dimension scanning electron microscopy tools in the factory, to monitor process recipe and integration, and to conduct yield analysis on a constant basis.[k]
4. Networked enterprises are able to deliver services more efficiently.	Architecture, engineering and construction services, and R&D services	SaaS and IaaS services help firms manage complex design content created by mechanical computer-aided design and electronic computer-aided design software tools. Cloud-based content management and filesharing systems allow AEC professionals around the world to access cost estimates, blueprints, photos, etc. remotely.[l]
	Healthcare	For patients with several providers, healthcare providers are coordinating patient care using electronic health records, along with cloud-based medical image archives and claims management systems.[m]
	Professional services	Service delivery can be improved by social network analysis to map company information flows and expertise across business units and around the world.[n]
	Professional services	Cloud-based collaboration software connects employees around the world and human capital management systems manage geographically dispersed teams and collaboration with outside providers.[o]

TABLE F.1 Competitive rationales for adoption of Internet technologies: Examples of how Internet technologies enable firms to lower costs and improve efficiency— ***continued***

Benefits of Internet technologies	**Sectors**	**Examples of specific technologies employed**
5. Data-intensive and transactionally intensive industries can achieve lower costs through cloud computing.	Banking	One-third of banks use some form of cloud computing, including private cloud SaaS and IaaS systems. Adoption is strongest for internal functions such as email, file-sharing, and notes sharing because of concerns that the cloud environment is not secure or resilient enough to cope with the rigorous demands of regulators, internal operations, and customers.[p]
	Energy exploration	Better seismic mapping technology and geophone sensors generate huge amounts of geological data which may be analysed to optimize oil drilling and fracking. Cloud data-processing services allow smaller energy exploration companies to access high-powered computing facilities.[q]
	Insurance	Insurance firmas are able to lower IT costs, and process transactions in real time, as cloud computing IaaS and PaaS resources are flexible and scalable. They can also use sophisticated analytics for more accurate pricing of risk and improved fraudulent-claims detection.[r]
	Securities trading and broking	Private cloud SaaS and IaaS services are used to process transactions, manage risks, and manage client relationships. Market data is a major source of Big Data; in 2011, 15 terabytes of options market data and 2.5 terabytes of equity market data were accumulated. Securities firms use Big Data analytics combined with innovations in electronic trading capabilities to improve trading strategies' success.[s]

[a] Oracle White Paper, “Managing the Product Value Chain for the Industrial Manufacturing Industry,” June 2011.

[b] USITC, *Logistics Services*, 2005; UPS website, “Worldwide Facts,” n.d., http://www.ups.com/content/us/en/about/facts/worldwide.html (accessed May 31, 2013).

[c] Gonzalez, “An Overlooked (but Critical) Component of Transportation Management Systems,” November 13, 2009; FedEx website, “Electronic Data Exchange”; Berg Insight Report, “Executive Summary,” in *Container Tracking and Security*, May 2013.

[d] Mayer-Schonberger, *Big Data: A Revolution*, 2013, 59.

[e] Oracle white paper, “Managing the Product Value Chain for the Industrial Manufacturing Industry,” June 2011.

[f] Royal Bank of Scotland, “Join the Dots Digitally for Better Trade Financing,” May 2, 2013.

[g] Harris-Ferrante and Plummer, “Industries Aim to Evolve Cloud Computing beyond Support Functions to More Strategic Uses,” May 25, 2013.

[h] Bughin, Chui, and Manyika, “Clouds, Big Data, and Smart Assets,” August 2010.

[i] Eastman et al., *BIM Handbook*, 2011.

[j] Bob Violina, “The Internet of Things,” April 22, 2013.

[k] Evans, “Mind and Machine: The Industrial Internet,” November 26, 2012; Bughin, Chui, and Manyika, "Clouds, Big Data, and Smart Assets," August 2010; Scolville, “Mining Big Data to Deliver Big Results,” March 28, 2013.

[l] Oracle White Paper, “Managing the Product Value Chain for the Industrial Manufacturing Industry,” June 2011; McAfee, “What Every CEO Needs to Know about the Cloud,” January 2012.

[m] Harris-Ferrante and Plummer, “Industries Aim to Evolve Cloud Computing beyond Support Functions to More Strategic Uses,” May 25, 2013.

[n] Bughin, Chui, and Manyika, “Clouds, Big Data, and Smart Assets,” August 2010.

[o] Industry representative, telephone interview by Commission staff, April 22, 2013; Mc Afee, "What Every CEO Needs to Know about the Cloud," January 2012.

[p] Redshaw, “A Quick Look at Cloud Computing in Banking, 2012,” March 14, 2012.

[q] Mills, “Big Data and Microseismic Imaging Will Accelerate the Smart Drilling Oil and Gas Revolution,” May 8, 2013.

[r] Weiss, “2013 Industry Predicts: Digitalization Will Make Insurers More Agile,” January 30, 2013; Brat et al., “Big Data: the Next Big Thing for Insurers,” March 25, 2013.

TABLE F.2 Competitive rationales for adoption of Internet technologies: Examples of consumer benefits

Benefits of Internet technologies	**Sectors**	**Examples of specific technologies employed**
1. Consumers like multichannel, 24/7 access to goods and services through traditional, online, and mobile services.	Banking and investment management Insurance	Consumers of financial and insurance services are increasingly requiring multichannel access, including (but not replacing) physical branches, telephone services, online services, and mobile services.[a]
	Education	Developments include online access to educational materials and assignments through integrated learning management systems such as Blackboard; full online provision of higher-level courses/degrees; open-access, non-degree online courses (MOOCs).[b]
	E-government	E-government provides information on and administration of federal, state, and local government services, such as online tax return submission and tracking, vehicle registration services, employment services, and benefits administration, delivered via public and private cloud computing.[c]
	Information content industries	Key trends include online gaming, online news and financial information, TV/video downloads and streaming, and music downloads and streaming (see chapter 2).
	Retail trade	Most major stores have established online websites. Online shopping platforms such as those provided by Amazon, eBay, and Etsy are gaining market share.[d]
		Online payment systems and digital wallets provided by PayPal and other intermediaries improve payment security. Consumer confidence in online shopping is improved, and consumers with mobile Internet devices no longer need to carry cash or credit cards when shopping in stores.[e]
2. Online aggregators make it easier for consumers to research and transact purchases.	Banking and Insurance	Consumers supplement information from financial services providers' websites by using aggregator websites that compare proposed terms for mortgages, savings deposits, retail insurance products, etc.[f]
	Food and accommodation	Online reservation systems such as opentable.com provide a convenient way to reserve at restaurants. Major hotel chains have extensive online reservation and information sites, often linked between brands owned by the same group.[g]
	Retail trade	Location directory websites such as Yelp and consumer reports websites offer user ratings and comments (see chapter 2).
	Travel arrangement and reservation services for airlines, hotels, car rental	Travelers benefit from individual airline reservation and check-in systems and from travel aggregator websites, such as Expedia and Kayak, which offer user ratings and comments.[h]
3. Both consumers and suppliers benefit from more and better interaction: Social media are used to gather feedback from consumers and to conduct market research.	Financial services and insurance	Social media is a new channel by which to reach customers to get feedback on services delivered and on customer preferences.[i]
	Retail trade Consumer goods manufacturers	Companies encourage customer feedback on products and services through social media: for example, Facebook "likes" for a trial product, Amazon and Yelp.com customer ratings, eBay's "detailed seller ratings," and cocreation of products with a wider Web community. Blogs are also important; more than 68 million bloggers post reviews of products and services.[j]

TABLE F.2 Competitive rationales for adoption of Internet technologies: Examples of consumer benefits—***continued***

Benefits of Internet technologies	**Sectors**	**Examples of specific technologies employed**
4. Both consumers and suppliers benefit from more and better interaction: Big Data analytics and the Internet of Things (machine-to-machine digital networks) help producers to tailor products to customer preferences and to price products more efficiently.	Financial services Retail trade	Big Data analytics (of loyalty card customer data, for example) are used by retailers and financial institutions to determine consumer preferences and identify market segments.[k]
	Government services	In the city of Groningen in the Netherlands, Vodafone has put sensors on trash containers that serve public housing units. The sensors alert trash haulers when they need to be emptied, saving on unnecessary trips and reducing fuel use by 18 percent.[l]
	Healthcare	Patient monitoring systems are becoming more widespread and sophisticated. For example, General Electric Corporation has worked with Mt. Sinai Medical Center in New York to improve operations of the 1,100 bed-hospital. Upon checking in, patients receive sensor-embedded wristbands that track their location and provide necessary information. The sensors give details about illnesses, medical resources, and treatment protocols for individual patients as well as the overall hospital population.[m]
	Insurance	Telematics-based auto insurance appears to be gaining ground. Some U.S. and European auto insurance providers are introducing "safe driver" pricing models that use data gathered by an in-car sensor.[n]
	Utilities	Smart meters for electricity allow utilities to better manage the peak load demands on the power grid, and help consumers get instant feedback on their energy usage. The nascent smart grid-related cloud services market is forecast to reach $4 billion by 2020.[o]

[a] Maguire et al., "Distribution 2020: The Next Big Journey for Retail Banks," March 20, 2013; Accenture, "Achieving a Competitive Advantage through Consumer-Driven Innovation," June 13, 2011.

[b] Dunn,"The 20 Best Learning Management Systems," October 27, 2012.

[c] Terdiman, "White House Unveils Cloud Computing Initiative," September 15, 2009; Bughin, Chui and Manyika, "Clouds, Big Data, and Smart Assets," August 2010; written testimony of Nicklous Combs, Chief Technology Officer, EMC Federal, "Cloud Computing: Benefits and Risks of Moving Federal IT into the Cloud," before the House Committee on Oversight and Government Reform and the Subcommittee on Government Management, Organization, and Procurement, July 1, 2010.

[d] Morgan Stanley Research, "eCommerce Disruption: A Global Theme—Transforming Traditional Retail," January 6, 2013.

[e] Cooper, "Digital Wallets Open Up," *The Banker*, May 1, 2013.

[f] Maguire et al., "Distribution 2020: The Next Big Journey for Retail Banks," March 20, 2013; Comscore, "Emerging Auto Insurance and Aggregator Sites Attracting Meaningful Share of Online Auto Insurance Market," March 4, 2011.

[g] For example, see www.opentable.com; www.marriott.com; www.hilton.com; www.hyatt.com.

[h] For example, see www.expedia.com; www.travelocity.com; or www.kayak.com.

[i] Maguire et al., "Distribution 2020: The Next Big Journey for Retail Banks," March 20, 2013; Accenture, "Achieving a Competitive Advantage through Consumer-Driven Innovation," June 13, 2011.

[j] Bughin, Chui, and Manyika, "Clouds, Big Data, and Smart Assets," August 2010.

[k] Ibid.

[l] Svensson, "Wireless Connections Creep into Everyday Things," February 27, 2013.

[m] Ibid.; Bughin, Chui, and Manyika, "Clouds, Big Data, and Smart Assets," August 2010.

[n] Brat et al., "Big Data: the Next Big Thing for Insurers," March 25, 2013.

[o] Zpryme, "Cloud Solutions for a Smarter Grid," March 1, 2013.

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APPENDIX G
International Trade and Investment Data

TABLE G.1 BEA-defined digitally enabled international cross-border U.S. services trade, 2007–11[a]

	2007	2008	2009	2010	2011
	Exports (*million $*)				
Royalties and license fees	97,803	102,125	98,406	107,165	120,836
Financial and insurance services	72,217	76,430	79,023	84,876	89,532
Telecommunications	8,239	9,999	10,102	11,099	12,650
Business, professional, and technical services (less construction)	103,791	115,088	117,240	127,052	133,114
-Computer and information services[b]	11,987	13,120	13,714	13,984	15,501
Total BEA-defined digitally enabled exports	282,050	303,642	304,771	330,192	356,132
	Imports (*million $)*				
Royalties and license fees	26,479	29,623	31,297	33,434	36,620
Financial and insurance services	66,714	76,131	78,216	75,776	72,826
Telecommunications	7,272	7,761	7,579	8,040	7,690
Business, professional, and technical S\services (less construction)	69,848	82,037	82,258	90,004	104,142
-Computer and information services[b]	15,112	16,895	18,205	21,094	24,538
Total BEA-defined digitally enabled imports	170,313	195,552	199,350	207,254	221,278

Source: U.S. Department of Commerce, Bureau of Economic Analysis International Services Statistics, "Table 1. Trade in Services, 1999–2011," http://bea.gov/international/international_services.htm (accessed June 27, 2013).

[a] Industry sectors defined as digitally enabled by BEA. For further info, see Borga and Koncz-Bruner, "Trends in Digitally-Enabled Trade in Services," 2012.

[b] Computer and information services are one component of business, professional, and technical services.

TABLE G.2 U.S. cross-border services exports and imports of other private services and royalties, 2007–11

Region	Country	2007	2008	2009	2010	2011
		Exports (*million $*)				
Europe		145,994	156,696	149,829	151,748	165,299
	United Kingdom	33,618	38,540	17,957	35,692	36,853
	Ireland	19,976	23,059	24,129	23,732	26,839
	Switzerland	15,100	17,098	16,433	18,073	20,316
	Germany	16,196	17,492	16,422	15,766	16,248
	Netherlands	9,282	12,442	10,751	10,238	11,635
	France	10,556	11,250	10,936	11,021	11,352
	Other Europe	34,990	36,816	35,481	37,225	42,056
Asia and Pacific		68,858	74,737	80,357	94,398	101,770
Latin America and other W. Hemisphere		40,229	44,422	46,424	52,734	56,571
	Bermuda	7,956	9,243	10,546	10,909	10,517
	Other Lat. Am.	32,272	35,179	35,880	41,825	46,054
North America		37,206	38,479	37,789	41,021	43,667
	Canada	23,177	23,626	23,914	26,900	28,951
	Mexico	14,029	14,853	13,875	14,121	14,716
Middle East		8,661	10,246	10,799	11,383	11,952
Africa		6,405	7,358	8,224	8,805	9,447
Total World		220,879	331,938	174,885	360,089	388,706
		Imports (*million $*)				
Europe		92,509	101,750	97,617	96,693	104,324
	United Kingdom	27,390	29,734	27,389	29,101	32,425
	Switzerland	13,150	15,786	16,269	16,582	16,319
	Germany	13,886	16,930	14,229	12,488	13,355
	France	8,590	7,665	9,201	8,948	9,456
	Ireland	11,364	10,811	9,361	7,445	8,032
	Netherlands	4,607	5,108	4,469	5,191	5,485
	Other Europe	13,523	15,716	16,899	16,938	19,252
Latin America and other W. Hemisphere		28,039	38,468	49,009	49,553	48,600
	Bermuda	17,423	23,226	32,685	30,837	28,113
	Other Lat. Am.	10,616	15,242	16,324	18,714	20,487
North America		16,161	16,699	15,912	17,644	19,137
	Canada	12,952	13,302	12,680	14,602	15,581
	Mexico	3,209	3,397	3,232	3,042	3,556
Asia and Pacific		34,810	38,800	37,489	43,105	49,323
Africa		2,284	2,472	2,587	2,759	3,053
Middle East		2,454	3,072	3,190	3,229	4,097
Total World		176,256	201,261	205,804	212,983	228,534

Source: U.S. Department of Commerce, Bureau of Economic Analysis International Services Statistics, "Table 4. Royalties and License Fees, 2006–2011," and "Table 5. Other Private Services, 2006–2011," http://bea.gov/international/international_services.htm (accessed June 27, 2013).

TABLE G.3 Information services supplied abroad by U.S. multinational corporations through their MOFAs, 2006–10

Country	2006	2007	2008	2009	2010
			Million $		
Canada	3,595	4,140	3,971	5,996	6,332
France	4,045	3,794	4,475	4,713	4,824
Germany	5,260	6,031	6,104	6,456	7,020
Netherlands	5,925	8,152	9,980	8,674	8,860
Switzerland	2,871	2,527	3,197	3,747	3,715
United Kingdom	28,073	30,500	31,479	29,906	24,585
Other Europe	21,096	25,152	30,215	30,621	40,540
Latin America and other Western Hemisphere	7,255	10,845	13,165	13,798	16,549
Australia	5,722	6,365	6,369	5,961	6,862
Japan	3,447	([a])	6,224	7,856	4,606
Other Asia-Pacific countries	5,217	([a])	([a])	8,875	10,190
Total	92,507	([a])	([a])	126,603	134,083

Source: U.S. Department of Commerce, Bureau of Economic Analysis International Services Statistics, "Table 9. Services Supplied to Foreign Persons by U.S. MNCs, Through Their MOFAs, Industry of Affiliate by Country of Affiliate, 2006–2010," http://bea.gov/international/international_services.htm (accessed June 27, 2013).

[a]Suppressed to avoid disclosure of data of individual companies.

TABLE G.4 Information services supplied by U.S. multinational corporations, through their MOFAS, 2007–10

	2007	2008	2009	2010
		Million $		
Publishing industries	([a])	([a])	33,096	42,754
Newspaper, periodical, book, and database publishers	10,920	([a])	8,135	8,380
Software publishers	([a])	23,861	24,962	34,375
Motion picture and sound recording industries	([a])	16,825	15,689	15,647
Motion picture and video industries	12,092	13,026	12,778	14,186
Sound recording industries	([a])	3,799	2,911	1,461
Telecommunications	([a])	([a])	31,805	31,038
Wired telecommunications carriers	13,783	13,633	23,255	21,529
Wireless telecommunications carriers (except satellite)	4,314	5,441	5,689	6,883
Other telecommunications	([a])	([a])	2,862	2,627
Broadcasting (except Internet)	6,841	8,309	9,764	11,931
Internet service providers, Web search portals, data processing services, Internet publishing and broadcasting, and other information services	([a])	([a])	36,248	32,712
Total information services	([a])	([a])	126,603	134,083

Source: U.S. Department of Commerce, Bureau of Economic Analysis International Services Statistics, "Table 9. Services Supplied to Foreign Persons by U.S. MNCs, Through Their MOFAs, Industry of Affiliate by Country of Affiliate, 2006–2010," http://bea.gov/international/international_services.htm (accessed June 27, 2013).

[a] Suppressed to avoid disclosure of data of individual companies.

TABLE G.5 U.S. direct investment position abroad on a historical cost basis, information sector, by country, 2007–11

Country	2007	2008	2009	2010	2011
			Million $		
North America	7,953	8,059	10,560	8,255	8,145
Canada	4,968	5,210	7,720	6,508	6,175
Mexico	2,985	2,849	2,840	1,747	1,970
Europe	78,340	88,066	89,924	78,146	84,322
Austria	-23	-55	-29	35	-9
Belgium	-716	-785	307	418	706
Czech Republic	195	187	149	154	106
Denmark	614	1,027	1,768	910	(c)
Finland	147	151	112	92	87
France	2,082	2,612	2,677	2,324	2,036
Germany	2,445	3,839	4,832	4,745	7,001
Greece	44	20	41	10	-30
Hungary	64	100	191	282	361
Ireland	7,866	24,684	13,292	15,977	20,194
Italy	2,383	2,597	3,200	3,038	3,050
Luxembourg	2,127	1,119	6,505	5,969	5,781
Netherlands	12,391	11,169	14,809	7,035	7,398
Norway	38	1,704	1,636	1,959	(c)
Poland	507	622	335	490	226
Portugal	58	96	23	28	42
Russia	29	64	121	146	193
Spain	499	453	1,062	1,350	862
Sweden	178	716	1,017	1,123	1,164
Switzerland	2,877	2,971	3,431	5,216	6,267
Turkey	69	-17	74	98	81
United Kingdom	44,362	34,720	34,514	26,535	25,439
All other Europe	106	73	-146	212	(c)
Latin America and Other Western Hemisphere	5,016	5,940	9,886	10,998	12,842
South America	3,445	3,996	4,912	6,549	8,279
Argentina	790	904	889	1,116	1,203
Brazil	1,963	2,476	2,990	4,150	5,408
Chile	129	121	305	(c)	556
Colombia	58	33	-14	-69	-75
Ecuador	2	2	4	4	4
Peru	210	61	(c)	366	438
Venezuela	43	142	218	(c)	(c)
All other South America	251	258	(c)	164	(c))
Central America	21	26	2,903	1,813	2,037
Costa Rica	16	16	38	39	43
Guatemala	(a)	(a)	(a)	(a)	(a)
Honduras	(b)	(b)	3	3	3
Panama	-6	-5	(*)	1	2
All other Central America	11	15	22	22	18
Other Western Hemisphere	1,551	1,917	2,070	2,636	2,526
Bahamas	(a)	(a)	(a)	(a)	(a)
Barbados	-1	(c)	144	30	24
Bermuda	494	518	459	1,255	1,207
Dominican Republic	20	(c)	141	119	94
Jamaica	(a)	(a)	(a)	(a)	(a)
Netherlands Antilles	(a)	(a)	(a)	(a)	(a)
Trinidad and Tobago	(a)	(a)	(a)	(a)	(a)
United Kingdom Islands, Caribbean	(c)	(c)	627	766	770
All other Western Hemisphere	(c)	(c)	699	467	431
Africa	172	171	174	183	197
Egypt	2	-6	2	(c)	(c)
Nigeria	1	1	2	(c)	(c)
South Africa	136	147	140	149	148
All other Africa	34	29	30	30	45

TABLE G.5 U.S. direct investment position abroad on a historical cost basis, information sector, by country, 2007–11—***continued***

Country	2007	2008	2009	2010	2011
			Million $		
Middle East	1,226	1,560	704	867	694
Israel	1,191	1,502	615	(c)	(c)
Saudi Arabia	13	(b)	5	4	4
United Arab Emirates	33	(c)	96	(c)	(c)
All other Middle East	-11	(c)	-11	-1	3
Asia and Pacific	24,216	27,189	26,680	29,362	31,906
Australia	12,746	13,790	10,952	14,163	13,967
China	546	724	2,487	2,684	3,259
Hong Kong	1,228	1,037	864	825	1,419
India	3,117	5,056	3,031	3,357	3,513
Indonesia	-50	18	26	27	38
Japan	4,426	4,186	6,524	4,911	5,318
Korea, Republic of	364	555	233	291	476
Malaysia	116	76	68	80	92
New Zealand	242	294	266	277	263
Philippines	37	35	77	72	80
Singapore	1,288	1,243	1,935	2,420	3,229
Taiwan	132	157	131	168	168
Thailand	22	15	52	51	45
All other Asia and Pacific	1	1	32	35	38
Total World	116,923	130,985	135,088	126,063	136,136

Source: U.S. Department of Commerce, Bureau of Economic Analysis International Services Statistics, International Data, "Direct Investment & Multinational Companies (MNCs)," http://www.bea.gov/iTable/index_MNC.cfm (accessed June 27, 2013).

[a] Data not available.
[b] Indicates a non-zero value between –$500,000 and +$500,000, or fewer than 50 employees, as appropriate.
[c] Data suppressed by BEA to avoid disclosing individual company information.

TABLE G.6 U.S. direct investment outflows, information sector, by country, 2007–11

Country	2007	2008	2009	2010	2011
			Million $		
North America	2,572	789	1,889	-630	1,471
Canada	2,332	713	1,834	238	1,089
Mexico	240	76	55	-868	382
Europe	2,595	3,633	5,840	6,936	6,770
Austria	-4	-32	-3	47	-46
Belgium	-185	-93	164	149	204
Czech Republic	(a)	18	43	25	-33
Denmark	301	347	204	200	144
Finland	10	15	9	-9	2
France	-437	239	244	678	-437
Germany	-302	663	390	345	107
Greece	-155	-26	-1	-22	-30
Hungary	44	99	58	13	63
Ireland	-1,143	4,765	4,200	1,945	4,308
Italy	538	451	-388	669	30
Luxembourg	(a)	-602	-101	-591	279
Netherlands	941	-1,158	-131	-338	341
Norway	104	1,139	97	142	-79
Poland	140	101	39	151	-707
Portugal	2	24	14	11	19
Russia	19	37	23	22	-4
Spain	99	-133	342	84	-81
Sweden	20	891	15	57	35
Switzerland	-31	477	211	648	920
Turkey	8	-74	19	23	-14
United Kingdom	2,564	-3,507	385	2,313	1,545
All other Europe	(a)	-10	7	375	203
Latin America and Other Western Hemisphere	834	1,074	1,128	1,823	1,468
South America	400	646	717	1,544	1,558
Argentina	267	163	113	241	184
Brazil	769	600	731	893	977
Chile	37	13	(a)	(a)	124
Colombia	15	-31	-38	-58	-10
Ecuador	(b)	(b)	(b)	(b)	(b)
Peru	62	-147	16	96	(a)
Venezuela	(a)	40	(a)	(a)	187
All other Latin America	(a)	7	-3	1	(a)
Central America	9	11	-24	9	8
Costa Rica	4	4	4	5	8
Guatemala	(c)	(c)	(c)	(c)	(c)
Honduras	-1	-1	-1	-1	-1
Panama	(b)	2	2	3	3
All other Central America	6	5	-28	1	-2
Other Western Hemisphere	425	417	435	270	-98
Bahamas	(c)	(c)	(c)	(c)	(c)
Barbados	-80	(a)	(a)	-104	-7
Bermuda	34	4	(a)	(a)	-81
Dominican Republic	9	(a)	(a)	(a)	(a)
Jamaica	(c)	(c)	(c)	(c)	(c)
Netherlands Antilles	(c)	(c)	(c)	(c)	(c)
Trinidad and Tobago	(c)	(c)	(c)	(c)	(c)
United Kingdom Islands, Caribbean	(a)	(a)	(a)	(a)	(a)
All other Western Hemisphere	(a)	(a)	(a)	(a)	(a)
Africa	23	18	13	35	47
Egypt	5	-5	(a)	(a)	(a)
Nigeria	1	1	(a)	(a)	(a)
South Africa	12	21	10	14	10
All other Africa	5	1	3	7	(a)

TABLE G.6 U.S. direct investment outflows, information sector, by country, 2007–11—***continued***

Country	2007	2008	2009	2010	2011
			Million $		
Middle East	-210	487	162	-275	-109
Israel	-230	447	136	([a])	([a])
Saudi Arabia	([a])	-2	-1	9	([a])
United Arab Emirates	([a])	([a])	([a])	([a])	([a])
All other Middle East	2	([a])	([a])	([a])	([a])
Asia and Pacific	2,748	1,945	-245	192	2,127
Australia	912	1,402	-1,730	1,698	-35
China	133	-170	-25	188	576
Hong Kong	-682	-199	47	82	46
India	1,749	570	48	419	428
Indonesia	22	-15	-9	8	19
Japan	343	367	1,261	-2,830	360
South Korea	-21	85	-123	23	173
Malaysia	24	-3	21	35	31
New Zealand	55	60	26	12	8
Philippines	12	4	5	10	-29
Singapore	157	-170	173	530	557
Taiwan	37	17	59	3	-16
Thailand	6	-4	-1	12	9
All other Asia and Pacific	1	1	1	1	1
Total World	8,562	7,946	8,786	8,080	11,773

Source: U.S. Department of Commerce, Bureau of Economic Analysis International Services Statistics, International Data, "Direct Investment & Multinational Companies (MNCs)," http://www.bea.gov/iTable/index_MNC.cfm (accessed June 27, 2013).

[a] Data suppressed by BEA to avoid disclosing individual company information.
[b] Indicates a non-zero value between –$500,000 and +$500,000, or fewer than 50 employees, as appropriate.
[c] Data not available.

TABLE G.7 Foreign direct investment in the United States and U.S. direct investment position abroad, information sector, by industry, 2007–11

Investments	2007	2008	2009	2010	2011
			Outbound		
			Million $		
Publishing industries	62,121	77,867	60,859	55,120	58,499
Newspaper, periodical, book, and database publishers	41,656	37,224	31,368	19,092	19,141
Software publishers	20,465	40,643	29,492	36,028	39,358
Motion picture and sound recording industries	13,086	10,818	12,755	8,955	9,009
Motion picture and video industries	6,729	6,278	7,786	7,819	7,630
Sound recording industries	6,357	4,540	4,969	1,136	1,380
Broadcasting and telecommunications	(a)	(a)	(a)	(a)	(a)
Broadcasting, cable networks, and program distribution	(a)	(a)	(a)	(a)	(a)
Radio and television broadcasting	(a)	(a)	(a)	(a)	(a)
Cable networks and program distribution	(a)	(a)	(a)	(a)	(a)
Telecommunications	(a)	(a)	(a)	(a)	(a)
Broadcasting (except Internet) and telecommunications	22,124	18,942	27,335	25,491	28,354
Broadcasting (except Internet)	5,677	6,467	6,789	7,941	9,810
Radio and television broadcasting	2,637	2,715	2,429	2,746	3,016
Cable and other subscription programming	3,041	3,752	4,361	5,196	6,794
Telecommunications	16,446	12,475	20,545	17,549	18,544
Wired telecommunications carriers	6,410	4,284	4,128	3,130	3,027
Wireless telecommunications carriers (except satellite)	2,332	2,403	1,957	1,594	2,398
Telecommunications resellers	699	271	261	-85	-60
Satellite telecommunications	2,570	2,636	2,787	2,919	3,539
Cable and other program distribution	3,744	3,235	4,699	2,985	3,770
Other telecommunications	692	-355	6,714	7,006	5,870
Internet, data processing, and other information services	19,592	23,358	28,416	30,141	31,308
Internet publishing and broadcasting	33	314	(b)	(b)	444
Internet service providers and Web search portals	6,639	5,972	6,451	(b)	7,061
Data processing, hosting, and related services	3,924	6,775	(b)	(b)	7,517
Other information services	8,995	10,297	(b)	15,289	16,286
Information services and data processing services	(a)	(a)	(a)	(a)	(a)
Information services	(a)	(a)	(a)	(a)	(a)
Data processing services	(a)	(a)	(a)	(a)	(a)
Total outbound information FDI	116,923	130,985	129,365	119,707	127,170
			Inbound		
			Million $		
Publishing industries	47,935	53,430	40,272	46,272	48,077
Newspaper, periodical, book, and database publishers	35,198	37,330	24,047	22,802	23,585
Software publishers	12,737	16,100	16,225	23,470	24,492
Motion picture and sound recording industries	(a)	(a)	(a)	(a)	(a)
Motion picture and video industries	(a)	(a)	(a)	(a)	(a)
Sound recording industries	(a)	(a)	(a)	(a)	(a)
Broadcasting and telecommunications	(a)	(a)	(a)	(a)	(a)
Broadcasting, cable networks, and program distribution	(a)	(a)	(a)	(a)	(a)
Radio and television broadcasting	(a)	(a)	(a)	(a)	(a)
Cable networks and program distribution	(a)	(a)	(a)	(a)	(a)
Telecommunications	(a)	(a)	(a)	(a)	(a)
Information services and data processing services	(a)	(a)	(a)	(a)	(a)
Information services	(a)	(a)	(a)	(a)	(a)
Data processing services	(a)	(a)	(a)	(a)	(a)
Telecommunications	53,370	51,042	48,818	49,293	54,749
Wired telecommunications carriers	(b)	(b)	(b)	(b)	(b)
Wireless telecommunications carriers (except satellite)	(b)	(b)	(b)	(b)	(b)
Telecommunications resellers	(a)	(a)	(a)	(a)	(a)
Satellite telecommunications	9,020	9,517	(b)	(b)	(a)
Cable and other program distribution	(a)	(a)	(a)	(a)	(a)
Other telecommunications	9,792	2,257	581	400	1,965

TABLE G.7 Foreign direct investment in the United States and U.S. direct investment position abroad, information sector, by industry, 2007-2011—***continued***

Investments	2007	2008	2009	2010	2011
			Million $		
All other Telecommunications	47,697	53,673	48,111	48,649	44,246
Motion picture and sound recording industries	8,512	14,477	12,595	14,459	12,378
Motion picture and video industries	(b)	(b)	(b)	(b)	(b)
Sound recording industries	(b)	(b)	(b)	(b)	(b)
Broadcasting (except Internet)	5,917	(b)	(b)	(b)	770
Radio and television broadcasting	(b)	(b)	(b)	(b)	(b)
Cable and other subscription programming	(b)	(b)	(b)	19	(b)
Data processing, hosting, and related services	848	(D)	358	215	230
Internet publishing and broadcasting	(a)	(a)	(a)	(a)	(a)
Internet service providers, Web search portals, and data processing services	(a)	(a)	(a)	(a)	(a)
Internet service providers and Web search portals	(a)	(a)	(a)	(a)	(a)
Data processing, hosting, and related services	(a)	(a)	(a)	(a)	(a)
Other information services	32,420	33,260	(b)	(b)	30,868
Total inbound information FDI	149,002	158,145	137,202	144,214	147,072

Source: U.S. Department of Commerce, Bureau of Economic Analysis International Services Statistics, International Data, "Direct Investment & Multinational Companies (MNCs)," http://www.bea.gov/iTable/index_MNC.cfm (accessed June 27, 2013).

[a] Data not available.
[b] Data suppressed by BEA to avoid disclosing individual company information.

TABLE G.8 U.S. direct investment outflows, information sector, by industry, 2007–11

	2007	2008	2009	2010	2011
			Million $		
Publishing industries	5,256	8,162	5,853	8,481	5,474
Newspaper, periodical, book, and database publishers	3,260	-684	-1,495	1,896	-69
Software publishers	1,996	8,845	7,348	6,585	5,543
Motion picture and sound recording industries	742	-2,356	723	2,150	-133
Motion picture and video industries	255	-140	671	662	-368
Sound recording industries	487	-2,216	51	1,487	235
Broadcasting and telecommunications	(a)	(a)	(a)	(a)	(a)
Broadcasting, cable networks, and program distribution	(a)	(a)	(a)	(a)	(a)
Radio and television broadcasting	(a)	(a)	(a)	(a)	(a)
Cable networks and program distribution	(a)	(a)	(a)	(a)	(a)
Telecommunications	(a)	(a)	(a)	(a)	(a)
Broadcasting (except Internet) and telecommunications	795	-830	167	-3,062	2,931
Broadcasting (except Internet)	869	462	-782	422	785
Radio and television broadcasting	302	193	190	380	344
Cable and other subscription programming	567	269	-973	42	441
Telecommunications	-74	-1,292	949	-3,484	2,147
Wired telecommunications carriers	-1,843	-1,392	-250	-291	507
Wireless telecommunications carriers (except satellite)	707	380	559	-371	346
Telecommunications resellers	1,917	-15	45	-12	14
Satellite telecommunications	-918	-33	60	156	648
Cable and other program distribution	250	293	320	-3,136	840
Other telecommunications	-188	-525	214	170	-209
Internet, data processing, and other information services	1,769	2,970	2,043	512	3,502
Internet publishing and broadcasting	-31	277	(b)	(b)	(b)
Internet service providers and Web search portals	17	-732	608	(b)	(b)
Data processing, hosting, and related services	639	1,716	(b)	(b)	(b)
Other information services	1,145	1,709	(b)	(b)	2,190
Information services and data processing services	(a)	(a)	(a)	(a)	(a)
Information services	(a)	(a)	(a)	(a)	(a)
Data processing services	(a)	(a)	(a)	(a)	(a)
Total outflow information FDI	8,562	7,946	8,786	8,080	11,773

Source: U.S. Department of Commerce, Bureau of Economic Analysis International Services Statistics, International Data, "Direct Investment & Multinational Companies (MNCs)," http://www.bea.gov/iTable/index_MNC.cfm (accessed June 27, 2013).

[a] Data not available.
[b] Data suppressed by BEA to avoid disclosing individual company information.

TABLE G.9 Foreign investment transactions by selected U.S. Internet companies, 2007–13

Transaction date	U.S. investor	Destination country	Amount invested (*million $*)	Transaction Type
4/1/2010	Amazon	Singapore	67.6	Greenfield
8/1/2010	Amazon	Romania	12.7	Greenfield
11/12/2010	Amazon	Spain	109.3	M&A
1/20/2011	Amazon	United Kingdom	319.6	M&A
2/1/2011	Amazon	Ireland	82.0	Greenfield
2/1/2011	Amazon	Ireland	82.0	Greenfield
2/1/2011	Amazon	Ireland	82.0	Greenfield
3/1/2011	Amazon	Japan	67.6	Greenfield
7/1/2011	Amazon	India	14.2	Greenfield
7/1/2011	Amazon	India	14.2	Greenfield
11/1/2011	Amazon	India	178.7	Greenfield
5/1/2012	Amazon	Ireland	27.9	Greenfield
6/1/2012	Amazon	China	32.1	Greenfield
8/9/2007	Autodesk	United Kingdom	25.0	M&A
1/1/2008	Autodesk	China	228.7	Greenfield
7/1/2008	Autodesk	Hong Kong	67.6	Greenfield
11/18/2008	Autodesk	Canada	35.0	M&A
12/1/2008	Autodesk	China	20.4	Greenfield
12/17/2009	Autodesk	Israel	25.0	M&A
2/1/2010	Autodesk	Israel	14.4	Greenfield
1/1/2007	Google	Switzerland	10.1	Greenfield
2/1/2007	Google	Netherlands	82.0	Greenfield
2/1/2007	Google	Singapore	23.4	Greenfield
4/1/2007	Google	Belgium	339.7	Greenfield
4/20/2007	Google	SE	14.8	M&A
7/1/2007	Google	UK	18.8	Greenfield
7/1/2007	Google	Denmark	10.1	Greenfield
10/1/2007	Google	Germany	10.1	Greenfield
2/1/2008	Google	South Korea	23.4	Greenfield
4/1/2008	Google	Costa Rica	12.7	Greenfield
6/1/2008	Google	Spain	18.8	Greenfield
7/1/2008	Google	Canada	108.0	Greenfield
11/1/2008	Google	Austria	213.9	Greenfield
2/1/2009	Google	Finland	200.0	Greenfield
6/1/2009	Google	UK	285.2	Greenfield
10/1/2009	Google	Ireland	18.8	Greenfield
4/30/2010	Google	Canada	44.5	M&A
5/1/2010	Google	Canada	108.0	Greenfield
8/1/2010	Google	Ireland	55.9	Greenfield
9/1/2010	Google	France	10.1	Greenfield
9/14/2010	Google	Israel	12.0	M&A
10/1/2010	Google	Belgium	344.6	Greenfield
11/1/2010	Google	India	14.2	Greenfield
11/1/2010	Google	India	14.2	Greenfield
2/1/2011	Google	Israel	22.9	Greenfield
2/1/2011	Google	Germany	20.6	Greenfield
3/1/2011	Google	Switzerland	57.1	Greenfield
3/1/2011	Google	Finland	10.1	Greenfield
3/7/2011	Google	United Kingdom	61.4	M&A
4/8/2011	Google	Canada	25.0	M&A
6/1/2011	Google	Taiwan	15.5	Greenfield
9/1/2011	Google	Hong Kong	300.0	Greenfield
9/1/2011	Google	Ireland	101.5	Greenfield
9/1/2011	Google	Taiwan	100.0	Greenfield
9/1/2011	Google	Singapore	67.6	Greenfield
1/1/2012	Google	Ireland	493.9	Greenfield
4/1/2012	Google	Belgium	131.5	Greenfield
8/1/2012	Google	Finland	183.3	Greenfield
9/1/2012	Google	Chile	150.0	Greenfield

TABLE G.9 Foreign investment transactions by selected U.S. Internet companies, 2007–13–***continued***

Transaction date	U.S. investor	Destination country	Amount invested (*million $*)	Transaction Type
11/30/2012	Google	Canada	17.1	M&A
2/1/2013	Google	Japan	14.9	Greenfield
9/4/2007	IBM	Canada	160.9	M&A
1/31/2008	IBM	Canada	5,000.0	M&A
6/1/2011	IBM	Russia	22.9	Greenfield
7/1/2011	IBM	Costa Rica	300.0	Greenfield
7/1/2011	IBM	Japan	67.6	Greenfield
7/1/2011	IBM	Japan	67.6	Greenfield
7/1/2011	IBM	Tunisia	12.7	Greenfield
9/1/2011	IBM	South Africa	89.8	Greenfield
10/21/2011	IBM	Canada	380.2	M&A
11/1/2011	IBM	Malaysia	314.1	Greenfield
11/1/2011	IBM	Romania	24.8	Greenfield
2/1/2012	IBM	China	98.9	Greenfield
4/1/2012	IBM	Canada	210.0	Greenfield
4/1/2012	IBM	Canada	90.0	Greenfield
8/1/2012	IBM	Kenya	24.0	Greenfield
8/1/2012	IBM	New Zealand	14.9	Greenfield
9/1/2012	IBM	Mexico	30.0	Greenfield
10/1/2012	IBM	France	75.1	Greenfield
11/1/2012	IBM	Canada	134.1	Greenfield
11/1/2012	IBM	Australia	11.8	Greenfield
1/1/2013	IBM	Spain	84.2	Greenfield
2/1/2013	IBM	Switzerland	84.2	Greenfield
2/13/2007	Microsoft	China	14.0	M&A
12/12/2007	Microsoft	United Kingdom	102.3	M&A
2/27/2008	Microsoft	Israel	30.0	M&A
7/14/2008	Microsoft	Israel	35.0	M&A
11/1/2008	Microsoft	South Korea	15.5	Greenfield
12/1/2008	Microsoft	Switzerland	28.5	Greenfield
3/1/2009	Microsoft	Philippines	23.4	Greenfield
5/1/2009	Microsoft	China	67.6	Greenfield
5/1/2009	Microsoft	Ireland	11.2	Greenfield
7/1/2009	Microsoft	Spain	15.7	Greenfield
7/1/2009	Microsoft	Brazil	12.5	Greenfield
8/1/2009	Microsoft	Taiwan	15.5	Greenfield
9/1/2009	Microsoft	Chile	12.5	Greenfield
9/1/2009	Microsoft	Mexico	12.5	Greenfield
10/22/2009	Microsoft	Netherlands	60.0	M&A
12/1/2009	Microsoft	Chile	10.3	Greenfield
4/1/2010	Microsoft	China	15.2	Greenfield
6/1/2010	Microsoft	Finland	20.6	Greenfield
6/1/2010	Microsoft	Taiwan	15.5	Greenfield
7/1/2010	Microsoft	Panama	10.3	Greenfield
11/1/2010	Microsoft	Russia	22.9	Greenfield
12/1/2010	Microsoft	India	14.2	Greenfield
1/1/2011	Microsoft	UK	32.2	Greenfield
2/1/2011	Microsoft	China	66.5	Greenfield
2/1/2011	Microsoft	Israel	14.0	Greenfield
5/1/2011	Microsoft	Canada	108.0	Greenfield
6/1/2011	Microsoft	Belgium	10.1	Greenfield
6/1/2011	Microsoft	Belgium	10.1	Greenfield
7/1/2011	Microsoft	Germany	20.6	Greenfield
7/1/2011	Microsoft	India	16.9	Greenfield
9/1/2011	Microsoft	Ireland	82.0	Greenfield
10/1/2011	Microsoft	Sweden	14.5	Greenfield
10/1/2011	Microsoft	Mexico	10.3	Greenfield
10/1/2011	Microsoft	Brazil	10.0	Greenfield
10/13/2011	Microsoft	Luxembourg	8,500.0	M&A

TABLE G.9 Foreign investment transactions by selected U.S. Internet companies, 2007–13–***continued***

Transaction date	U.S. investor	Destination country	Amount invested (*million $*)	Transaction Type
12/1/2011	Microsoft	France	52.1	Greenfield
12/1/2011	Microsoft	Canada	18.8	Greenfield
1/1/2012	Microsoft	Brazil	100.0	Greenfield
2/1/2012	Microsoft	Cote d'Ivoire (Ivory Coast)	12.7	Greenfield
3/1/2012	Microsoft	Netherlands	18.8	Greenfield
4/1/2012	Microsoft	UK	13.5	Greenfield
7/1/2012	Microsoft	UK	44.4	Greenfield
9/1/2012	Microsoft	Ireland	27.9	Greenfield
9/1/2012	Microsoft	Israel	13.9	Greenfield
12/1/2012	Microsoft	China	48.1	Greenfield
1/1/2013	Microsoft	Belgium	55.0	Greenfield
7/1/2007	Oracle	China	31.3	Greenfield
10/1/2007	Oracle	India	14.2	Greenfield
10/1/2007	Oracle	Spain	14.1	Greenfield
11/1/2007	Oracle	Philippines	15.5	Greenfield
2/1/2008	Oracle	China	18.3	Greenfield
4/1/2008	Oracle	Romania	36.8	Greenfield
12/30/2008	Oracle	Australia	103.5	M&A
4/1/2010	Oracle	Chile	10.0	Greenfield
8/4/2010	Oracle	Australia	105.9	M&A
9/1/2010	Oracle	Australia	67.6	Greenfield
10/1/2010	Oracle	Spain	46.4	Greenfield
10/27/2010	Oracle	Israel	73.1	M&A
3/1/2011	Oracle	India	11.9	Greenfield
10/1/2012	Oracle	Singapore	58.5	Greenfield
10/1/2012	Oracle	Nigeria	13.9	Greenfield
1/1/2013	Oracle	Australia	136.4	Greenfield
2/1/2008	Symantec	China	150.0	Greenfield
2/1/2008	Symantec	China	20.4	Greenfield
11/14/2008	Symantec	United Kingdom	695.0	M&A
8/10/2010	Symantec	Japan	106.9	M&A
5/1/2011	Symantec	India	14.2	Greenfield
4/1/2007	Yahoo	Japan	23.4	Greenfield
2/1/2008	Yahoo	Israel	22.9	Greenfield
3/1/2008	Yahoo	Switzerland	18.8	Greenfield
8/1/2008	Yahoo	India	32.2	Greenfield
9/1/2008	Yahoo	Singapore	11.2	Greenfield
5/1/2009	Yahoo	China	39.7	Greenfield
8/1/2009	Yahoo	Taiwan	67.6	Greenfield
11/13/2009	Yahoo	JO	100.0	M&A
4/1/2010	Yahoo	India	17.9	Greenfield
10/1/2010	Yahoo	Japan	124.8	Greenfield
3/1/2011	Yahoo	Singapore	67.6	Greenfield
3/1/2011	Yahoo	China	20.4	Greenfield
3/25/2013[a]	Yahoo[a]	United Kingdom	30.0	M&A

Sources: Bureau van Dijk, Zephyr M&A database, and Financial Times, fDi Markets FDI database. Transaction amounts have not been individually verified with the companies involved, https://zephyr2.bvdep.com/version-2013614/Home.serv?product=zephyrneo (accessed March 25, 2013).

[a] According to Bureau van Dijk, Yahoo's March 25, 2013 acquisition in the United Kingdom had not been completed as of June 2013.

TABLE G.10 Top 10 exporters and importers of digitally enabled services, 2007–11

	2007	2008	2009	2010	2011
Country	Exports receipts (*million $*)				
United States	274,535	294,251	295,135	319,891	343,937
United Kingdom	199,909	195,417	183,685	189,070	204,710
Germany	107,982	126,368	128,520	129,995	143,481
France	46,598	56,167	87,180	87,582	107,699
Ireland	81,544	87,705	83,642	88,438	101,780
Netherlands	61,654	71,129	67,140	69,400	82,774
Japan	64,813	74,260	70,851	75,230	81,551
Switzerland	45,408	53,163	53,267	59,359	67,909
Luxembourg	54,328	55,426	46,186	52,710	59,124
Spain	42,408	48,549	43,419	43,588	50,954
All other OECD members	288,713	332,391	297,415	310,331	349,675
Total OECD	1,267,892	1,394,825	1,356,441	1,425,593	1,593,595
	Imports payments (*million $*)				
United States	162,604	187,238	191,121	198,461	212,741
Germany	97,886	109,505	108,938	107,950	123,921
Ireland	81,905	96,008	92,034	96,415	104,908
United Kingdom	77,387	82,325	76,165	76,546	82,360
France	47,201	51,448	75,280	74,309	82,233
Japan	64,133	72,999	68,708	72,391	80,394
Netherlands	52,395	61,395	63,108	60,970	71,931
Italy	55,973	58,788	48,349	48,515	52,047
Spain	48,793	51,859	45,774	44,454	48,710
Canada	36,151	37,519	34,643	21,466	47,390
All other OECD members	236,723	281,738	265,324	268,974	305,913
Total OECD	961,151	1,090,822	1,069,445	1,070,452	1,212,549

Source: OECD (2012), "Trade in services—EBOPS 2002", *OECD Statistics on International Trade in Services* (database), http://www.oecd-ilibrary.org/trade/data/oecd-statistics-on-international-trade-in-services_tis-data-en (accessed July 1, 2013).

TABLE G.11 OECD top digital export and import service categories for selected countries, 2007–11

Country		2007	2008	2009	2010	2011
		Exports (*million $*)				
France	Computer and information services	1,907	1,838	3,615	3,534	4,190
	Financial services	1,796	1,961	2,232	3,322	6,525
	Insurance services	1,046	828	3,865	3,677	5,323
	Other business services	31,041	38,194	60,790	60,378	71,820
	Personal, cultural and recreational services	1,963	2,221	2,660	3,540	4,137
	Royalties and license fees	8,846	11,125	14,018	13,132	15,704
	France Total	46,598	56,167	87,180	87,582	107,699
Germany	Computer and information services	12,651	15,514	14,839	16,539	18,606
	Financial services	11,866	13,550	12,950	12,658	14,648
	Insurance services	5,846	4,581	5,298	5,850	6,393
	Other business services	68,057	80,627	76,237	79,096	88,595
	Personal, cultural and recreational services	1,121	1,096	1,235	1,106	906
	Royalties and license fees	8,442	11,001	17,959	14,746	14,334
	Germany Total	107,982	126,368	128,520	129,995	143,481
Ireland	Computer and information services	29,736	34,974	33,830	36,937	44,233
	Financial services	10,183	9,661	8,049	8,378	9,168
	Insurance services	12,043	11,946	10,141	10,549	11,313
	Other business services	28,155	29,365	29,616	29,337	31,659
	Personal, cultural and recreational services	244	270	317	334	353
	Royalties and license fees	1,184	1,490	1,689	2,903	5,055
	Ireland Total	81,544	87,705	83,642	88,438	101,780
United Kingdom	Computer and information services	14,058	13,481	12,787	13,505	14,687
	Financial services	74,554	72,209	58,539	53,971	64,953
	Insurance services	10,181	10,264	24,464	23,369	16,358
	Other business services	81,087	80,595	70,604	80,114	89,925
	Personal, cultural and recreational services	3,758	4,190	3,538	3,946	4,610
	Royalties and license fees	16,271	14,679	13,754	14,165	14,176
	United Kingdom Total	199,909	195,417	183,685	189,070	204,710
		Imports (*million $*)				
France	Computer and information services	2,283	2,247	5,039	4,100	5,202
	Financial services	1,942	1,915	1,859	2,385	3,670
	Insurance services	2,071	2,020	2,966	3,074	3,039
	Other business services	33,051	36,131	53,262	51,988	56,717
	Personal, cultural and recreational services	3,137	3,658	3,202	3,424	3,664
	Royalties and license fees	4,718	5,477	8,953	9,339	9,941
	France Total	47,201	51,448	75,280	74,309	82,233
Germany	Computer and information services	11,839	13,784	12,544	14,224	16,331
	Financial services	8,033	7,784	7,008	7,128	9,502
	Insurance services	3,286	4,239	3,574	3,960	4,554
	Other business services	60,729	67,833	65,256	66,634	77,657
	Personal, cultural and recreational services	2,798	2,940	2,784	2,783	2,715
	Royalties and license fees	11,201	12,924	17,771	13,220	13,162
	Germany Total	97,886	109,505	108,938	107,950	123,921
Ireland	Computer and information services	903	1,036	868	873	945
	Financial services	6,344	6,523	5,953	5,977	6,635
	Insurance services	9,763	9,221	8,607	8,307	8,337
	Other business services	40,822	43,505	41,503	43,634	48,163
	Personal, cultural and recreational services	164	164	167	196	207
	Royalties and license fees	23,909	35,559	34,935	37,428	40,621
	Ireland Total	81,905	96,008	92,034	96,415	104,908
United Kingdom	Computer and information services	5,515	6,416	6,234	6,613	6,398
	Financial services	14,062	13,984	10,017	9,725	12,295
	Insurance services	2,041	2,037	6,119	4,711	3,520
	Other business services	45,055	47,306	44,515	45,969	48,460
	Personal, cultural and recreational services	1,905	2,011	908	1,038	1,025
	Royalties and license fees	8,810	10,571	8,372	8,489	10,661
	United Kingdom Total	77,387	82,325	76,165	76,546	82,360

Source: OECD iLibrary, "OECD Statistics on International Trade in Services," http://stats.oecd.org/BrandedView.aspx?oecd_bv_id=tis-data-en&doi=data-00274-en (accessed June 27, 2013).