

THE INTERNET ECONOMY 25 YEARS AFTER .COM

TRANSFORMING
COMMERCE & LIFE



March 2010

Robert D. Atkinson, Stephen J. Ezell, Scott M. Andes, Daniel D. Castro, and Richard Bennett



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**The Information Technology
& Innovation Foundation**



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ABOUT THE AUTHORS

Dr. Robert D. Atkinson is President of the Information Technology and Innovation Foundation.

Stephen J. Ezell is a Senior Analyst at the Information Technology and Innovation Foundation.

Scott M. Andes is a Research Analyst at the Information Technology and Innovation Foundation.

Daniel D. Castro is a Senior Analyst at the Information Technology and Innovation Foundation.

Richard Bennett is a Research Fellow at the Information Technology and Innovation Foundation.

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The Information Technology and Innovation Foundation is a 501c(3) nonprofit organization.

To find out more about the Information Technology and Innovation Foundation, please contact us at:

1101 K Street, NW, Suite 610, Washington, DC 20005

E-mail: mail@itif.org. Phone: (202) 449-1351

Web: www.innovationpolicy.org

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If one read only the mainstream media, one might not be blamed for thinking that the dot-com revolution is principally about Web 2.0 applications such as Twitter, Facebook, or Wikipedia. But while certainly interesting and useful, these kinds of applications represent only a small fraction of the impact of the “commercial Internet.” In fact, in the 25 years since the first .com, Symbolics.com, leapt onto the world stage on March 15, 1985, the commercial Internet has revolutionized businesses, economies, and societies throughout the world.¹ The Internet economy has spawned a multitude of innovative “dot-com” companies; unleashed entirely new business models; spurred the creation of new products and services; changed how consumers shop; transformed how corporations sell their products and procure their inputs; boosted economic growth; and fundamentally altered how individuals interact, build communities, and socialize.

As of September 2009, an estimated 1.7 billion of the world’s 6.7 billion citizens (25.6 percent) use the Internet, with usage growing 380 percent from 2000 to 2009.² It’s now hard to remember a time when the Internet and dot-com Web sites were not part of daily life. Yet, just 15 years ago, there were only 18,000 Web sites, while today there are more than 80 million .com domain names alone. With this extraordinary migration to “life online” as a backdrop, this report analyzes and catalogs the Internet’s myriad and ever-growing benefits to consumers and businesses alike from what is known as the Internet (or “dot-com”) economy.

Over the last 25 years, the use of .com domain names has expanded rapidly from a specialized name space for the high-tech community to an integral part of the global economy. Notwithstanding the collapse of the dot-com bubble, since the end of 2000 the number of registered .com domain names has increased dramatically, with 668,000 new .com domains registered, on average, each month. Moreover, while 21 million .com domain names were registered between 1985 and 2000, in just the ten years since 2000, close to 60 million more have been registered. And the overall query load (individually accessed .com and .net Web pages) per day has increased from 14 billion queries in 2004 to 49 billion in 2009.

ITIF estimates that the annual global economic benefits of the commercial Internet equal \$1.5 trillion, more than the global sales of medicine, investment in renewable energy, and government investment in R&D, combined.³ And if e-commerce continues to grow even just half as fast as it grew between 2005 and 2010, then by 2020 global e-commerce will add \$3.8 trillion annually to the global economy—more than the total GDP of Germany. While the share of e-commerce conducted just through dot-com domains is smaller, ITIF estimates that it is still substantial, generating an estimated \$400 billion in economic benefits

annually throughout the world, an amount that is expected to grow to \$950 billion annually by 2020.

The commercial Internet is transforming economies throughout the world. Across Europe, the percentage of dot-com shoppers grew by 85 percent between 2004 and 2009. In Korea, 32 percent of Internet users over the age of six regularly post to their own blogs. In the developing world, Internet users are almost as likely to have shopped online as their developed world counterparts; for example, 63 percent of Latin Americans and 70 percent of those in the Asia Pacific region have made at least one purchase online, compared to 85 percent of Internet users in both North America and Europe. While in all nations e-commerce is growing, some countries have taken the lead. ITIF assessed 30 nations on seven indicators, finding that four, Denmark, Sweden, the United Kingdom, and the United States, are in a group by themselves, leading the world in e-commerce.

The economic benefits conferred by the commercial Internet accrue to consumers, workers, businesses, and economies writ large. The commercial Internet helps consumers by making markets more efficient by expanding consumer access to information; lowering prices, both by enabling self-service opportunities and by allowing businesses to pursue lower-cost business models; expanding consumer choice; and helping to hold businesses accountable for high-quality products and services. Likewise, the commercial Internet helps workers by boosting wages and facilitating more efficient labor markets.

Moreover, the Internet economy boosts economic growth in a variety of ways. It enables firms to become more efficient and to raise productivity, thereby allowing consumers to save money or workers to earn more (or both), both of which boost GDP. The Internet economy also enables more efficient allocation of goods and services, for example, by enabling auction or matching

markets for an almost infinite variety of products, skills, and services, helping allocate them to the parties that value them the most, whether they are personal memorabilia on eBay, professional skills at Monster.com, or solutions to innovation challenges at InnoCentive. The dot-com economy also empowers the development of entirely new business models. For example, the commercial Internet empowers mass customization business models, for everything from Dell's build-to-order PCs over the Web to custom-designed Mini automobiles and Nike shoes. It has also enabled a range of software-as-a-service and cloud-based business models, such as the Web-based customer relationship management services offered by Salesforce.com. It also gives firms, especially small businesses, access to larger markets from down the street to across the globe.

Finally, businesses involved in enabling the dot-com economy contribute directly and substantially to economies, accounting, for example, for 2 percent of employment in the United States, with wages equaling 2 percent of U.S. GDP.⁴

The commercial Internet also delivers a wealth of non-economic benefits by: expanding information availability and access, including placing vast amounts of information online; increasing access to health information and even health services; providing "always available" online education opportunities; building communities by facilitating social interactions; offering more entertainment choices; and fostering a more sustainable, energy-efficient environment.

The global diffusion of the commercial Internet has occurred with astounding speed. Every country on Earth, developed and developing alike, has adopted the Internet. And while the dot-com bust of the early 2000s might have led some to believe that the Internet was merely a passing fad—the same way that those who derisively heckled car drivers with taunts of "get a horse" in the 1920s thought that automobiles were a passing fad—in fact, the dot-com start-ups of the late 1990s, as a whole, have actually achieved higher survival rates than most new technology start-ups throughout history have (and certainly higher rates than for most new start-up businesses in general). Moreover, what even the spectacular failure of once dot-com luminaries such as Webvan.com, pets.com, or Broadcast.com masks is that the services those companies envisioned offering over the Internet have indeed since come to fruition, even if delivered by competitors or other companies that crafted a more sustainable business model. For example, Webvan may have failed, but U.S. grocer Giant offers Peapod, an online grocery and delivery service. In short, despite the bursting of the "dot-com bubble" in the early 2000s, the Internet economy has subsequently more than fulfilled its initial promise to transform both the economy and society, and there appears to be no end in sight.

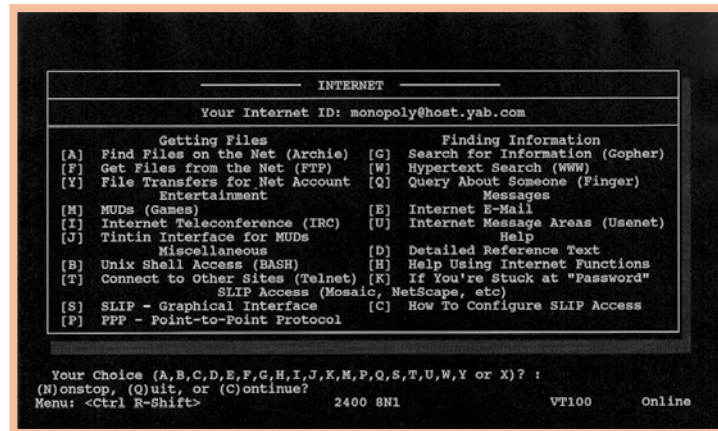
And more is likely to come. Future trends in the Internet economy will include ever greater adoption of existing technology, as more citizens and businesses around the world come online and engage in e-commerce; greater use of self-service technology; more high-bandwidth applications; greater

use of the mobile Internet; the growth of location-based services; and new Web-based applications that enable a smarter world. For example, "smart home" technologies will enable individuals to use the Internet to control their lights from a laptop, turn on their heaters using their iPhone, and schedule recordings on their TiVos remotely.

In total, surveying the 25 years since the first .com domain name was registered, one can rightly describe the commercial Internet as a general purpose technology (GPT), one whose significance to society should be viewed as on par with the advent of inexpensive steel, the telephone, the internal combustion engine, or electricity. Whereas the telegraph represented a global network for communication of short written messages, and the telephone a global network for voice communication, the Internet represents a unified global network for voice, data, and video. But even more than that, the Internet provides a fundamentally new digital infrastructure platform through which global commerce can occur.

General purpose technologies such as the Internet, which historically have appeared at a rate of once every half century, represent fundamentally new technology systems that change virtually everything, including what economies produce; how they produce it; how production is organized and managed; the location of productive activity; the skills required for productive activity; the infrastructure needed to enable and support it; and the laws and regulations needed to maintain, or even to allow, it.⁵ GPTs share a variety of similar characteristics. They typically start in relatively crude form for a single or very few purposes; they increase in sophistication as they diffuse throughout the economy; they engender extensive spillovers in the forms of externalities and technological complementarities; and their evolution and diffusion span decades (even centuries).⁶ Moreover, GPTs undergo rapid price declines and performance improvements; become pervasive and an integral part of most industries, products, and functions; and enable downstream innovations in products, processes, business models, and business organization. By any of these measures, the dot-com Internet ranks well against the most transformative technological breakthroughs (and subsequent commercializations) in human history.⁷

This report documents and celebrates the 25th anniversary of the commercial Internet, providing a brief history of the .com domain; chronicling the penetration and adoption of the commercial Internet in the United States, Europe, Asia, and the developing world, covering everything from the number of Web sites and users to total value and usage of e-commerce and social media; exploring new Internet-enabled business models; examining the Internet's economic impact on consumers, businesses, and workers; assessing the Internet's benefits to society; and closing with a glimpse into future trends in the Internet economy.



Early screen shot of the Internet

The .com domain is one of six top level domains (TLDs), Internet name categories created by Internet RFC 920 in October 1984 as part of a reorganization of the Internet naming bureaucracy.⁸ Since the early days of ARPANET, the task of tracking and sharing network names and addresses had been performed in a single office, originally through the Network Information Center at Stanford Research Institute (SRI NIC).⁹ The creation of TLDs relieved SRI NIC of the burdensome task of ensuring that each computer on the entire Internet had a unique official name. Dividing network names into six categories enabled administration to be delegated to several agencies, each responsible for a portion of the Internet. As the RFC explained:

Domains are administrative entities. The purpose and expected use of domains is to divide the name management required of a central administration and assign it to sub-administrations. There are no geographical, topological, or technological constraints on a domain. The hosts in a domain need not have common hardware or software, nor even common protocols. Most of the requirements and limitations on domains are designed to ensure responsible administration.¹⁰

A separate “sub-administration” was created for each of the domains, with each applying different policies regarding who could obtain a name, how much it cost, and how it could be used. This entire process was ultimately transferred to the Internet Corporation for Assigned Names and Numbers (ICANN), a private sector, non-profit corporation created in 1998 to assume responsibility for managing domain name systems.

A system for automatically translating computer and network names into Internet Protocol (IP) addresses (the familiar “dotted decimal” numbers such as 74.125.19.106 that serve as the Internet’s equivalent of phone numbers) had already been created by RFC 882 in 1983, but it couldn’t be deployed until the Internet community decided how it wanted to organize the name space and who would administer it.¹¹

The decision to organize domain names into specific master domains was driven by the belief that different kinds of organizations would want to manage their portion of the overall name system differently. This intuition proved correct, as the process for registering a name under .edu is very different from that for .com, .org, .gov, or .mil. The master list reflected the membership of the Internet at the time: half of the TLDs were government entities, many were universities, two were non-profits, and then there was .com; the catch-all for the small number of for-profit entities who were allowed on the Internet because they had government research contracts.

.com, a truncation of “company” and “commercial,” was almost named .cor, short for “corporate,” but the first choice was discarded when it was realized that non-profits can be corporations too (another candidate, .biz, was rejected because all organizations are businesses of a sort). Jake Feinler of SRI NIC is regarded by the Internet community as the chief instigator of .com, but nothing happened in Internet administration in those days unless it was approved by the late Jon Postel, the man unofficially responsible for keeping the Internet’s components consistent with each other.

Despite its prominence on today’s Internet, .com was a bit of an afterthought at the time. Internet use was circumscribed by an Acceptable Use Policy (AUP) created by the U.S Department of Defense that forbade for-profit activity outside the scope of research work, there weren’t any commercial Internet Service Providers, and it was difficult to get on the Internet, even for research institutions. CSNET, a network that connected university computer science departments to ARPANET through

a shared connection, was the easiest path to access, but CSNET didn’t accommodate for-profit organizations; its successor, NSFNET, was two years away from its deployment in 1986.

The annual global economic benefit of the commercial Internet equals \$1.5 trillion, more than the global sales of medicine, investment in renewable energy, and government investment in R&D, combined.

The first .com registration, symbolics.com, was issued on March 15, 1985, to Symbolics, Inc., a now defunct vendor of artificial intelligence systems spun out of the Massachusetts Institute of Technology (MIT).¹² The domain name was acquired by XF.com and now serves as the personal blog of XF.com owner Aron Meystedt. Symbolics wasn’t the kind of company thought of as a dot-com today. Its product line wasn’t network-oriented, and it didn’t transact business over the Internet (the AUP prohibited that sort of thing) but it had an Internet presence because of its close ties to MIT and the fact that most of its customers were academics. The “killer application” for Symbolics, as for most of the Internet, was e-mail, but the Internet connection would have simplified customer support and system maintenance as well. Other early domain name registrations went to ARPANET engineering firm BBN as well as to Carnegie Mellon University and several other universities in late April 1985.¹³ Table 1 shows a list of the 100 oldest .com domain names.

Table 1: 100 oldest .com domain names

Rank	Date	Domain Name	Rank	Date	Domain Name	Rank	Date	Domain Name
1	15-Mar-85	Symbolics.com	16	8-May-86	TEK.com	30	27-Oct-86	Inmet.com
2	24-Apr-85	BBN.com	18	10-Jul-86	FMC.com	30	27-Oct-86	Kesmai.com
3	24-May-85	Think.com	18	10-Jul-86	UB.com	30	27-Oct-86	Mentor.com
4	11-Jul-85	MCC.com	20	5-Aug-86	Bell-ATL.com	30	27-Oct-86	NEC.com
5	30-Sep-85	DEC.com	20	5-Aug-86	GE.com	30	27-Oct-86	Ray.com
6	7-Nov-85	Northrop.com	20	5-Aug-86	Grebyn.com	30	27-Oct-86	Rosemount.com
7	9-Jan-86	Xerox.com	20	5-Aug-86	ISC.com	30	27-Oct-86	Vortex.com
8	17-Jan-86	SRI.com	20	5-Aug-86	NSC.com	40	5-Nov-86	Alcoa.com
9	3-Mar-86	HP.com	20	5-Aug-86	Stargate.com	40	5-Nov-86	GTE.com
10	5-Mar-86	Bellcore.com	26	2-Sep-86	Boeing.com	42	17-Nov-86	Adobe.com
11	19-Mar-86	IBM.com	27	18-Sep-86	ITCorp.com	42	17-Nov-86	AMD.com
11	19-Mar-86	Sun.com	28	29-Sep-86	Siemens.com	42	17-Nov-86	DAS.com
13	25-Mar-86	Intel.com	29	18-Oct-86	Pyramid.com	42	17-Nov-86	Data IO.com
13	25-Mar-86	TI.com	30	27-Oct-86	AlphaCDC.com	42	17-Nov-86	Octopus.com
15	25-Apr-86	ATT.com	30	27-Oct-86	BDM.com	42	17-Nov-86	Portal.com
16	8-May-86	GMR.com	30	27-Oct-86	Fluke.com	42	17-Nov-86	Teltone.com

Rank	Date	Domain Name	Rank	Date	Domain Name	Rank	Date	Domain Name
42	11-Dec-86	3Com.com	67	4-Apr-87	Philips.com	85	31-Aug-87	Quick.com
50	11-Dec-86	Amdahl.com	68	23-Apr-87	Datacube.com	86	3-Sep-87	Allied.com
50	11-Dec-86	CCUR.com	68	23-Apr-87	Kai.com	86	3-Sep-87	DSC.com
50	11-Dec-86	CI.com	68	23-Apr-87	TIC.com	86	3-Sep-87	SCO.com
50	11-Dec-86	Convergent.com	68	23-Apr-87	Vine.com	89	22-Sep-87	Gene.com
50	11-Dec-86	DG.com	72	30-Apr-87	NCR.com	89	22-Sep-87	KCCS.com
50	11-Dec-86	Peregrine.com	73	14-May-87	Cisco.com	89	22-Sep-87	Spectra.com
50	11-Dec-86	Quad.com	73	14-May-87	RDL.com	89	22-Sep-87	WLK.com
50	11-Dec-86	SQ.com	75	20-May-87	SLB.com	93	30-Sep-87	Mentat.com
50	11-Dec-86	Tandy.com	76	27-May-87	ParcPlace.com	94	14-Oct-87	WYSE.com
50	11-Dec-86	TTI.com	76	27-May-87	UTC.com	95	2-Nov-87	CFG.com
50	11-Dec-86	Unisys.com	78	26-Jun-87	IDE.com	96	9-Nov-87	Marble.com
61	19-Jan-87	CGI.com	79	9-Jul-87	TRW.com	97	16-Nov-87	Cayman.com
61	19-Jan-87	CTS.com	80	13-Jul-87	Unipress.com	97	16-Nov-87	Entity.com
61	19-Jan-87	SPDCC.com	81	27-Jul-87	Dupont.com	99	24-Nov-87	KSR.com
64	19-Feb-87	Apple.com	81	27-Jul-87	Lockheed.com	100	30-Nov-87	NynexST.com
65	4-Mar-87	NMA.com	83	28-Jul-87	Rosetta.com			
65	4-Mar-87	Prime.com	84	18-Aug-87	Toad.com			

Source: <https://www.iwhois.com/oldest/>¹⁴

The Internet is a general purpose technology, one whose significance to society should be viewed as on par with the development of inexpensive steel, the telephone, the internal combustion engine, or electricity.

Brad Templeton, chairman of the Electronic Frontier Foundation, formed the ClariNet Communications Corporation (ClariNet) in 1989, which may be the first Internet-oriented businesses:¹⁵

ClariNet has a claim on being the first "dot-com." Of course, how one judges that depends on your definition of what a dot-com company is, and there are of course other definitions and other companies with valid claims.¹⁶

ClariNet was also the Internet's first, and for a long time largest, electronic newspaper; it distributed wire service copy to subscribers over Usenet, an unrestricted bulletin board-like system that intersected the Internet but was also independent of it, as CSNET had been. Until the creation of the Commercial Internet Exchange in 1991 and the subsequent privatization of NSFNET, ClariNet operated in what can charitably be described as a legal gray area, transacting commercial business

across the Internet in defiance of the AUP. ClariNet could do this because nobody was charged with enforcing the AUP, and Internet users as a whole tended toward a live-and-let-live attitude.

While .com was a domain address that businesses could obtain, the capability to conduct real business with it was enabled by the privatization of the Internet's backbone, completed by 1998.

The privatization of the backbone network involved reshaping the National Science Foundation Network (NSFNET) into what is known today as the Internet. This process affected both the content across the NSFNET as well as the control of the underlying infrastructure. The actual privatization consisted of government shifting from the practice of contracting out a government-subsidized backbone to allowing the market to provide backbone services.¹⁷

Commercial backbone services were initially provided at four Network Access Points owned by telephone companies; these have since been replaced by a worldwide network of 300 carrier-neutral Internet Exchange Points. Universities peered and purchased Internet transit services after privatization, just as commercial organizations do today.

The privatized Internet backbone was unregulated, which made commerce and investment feasible on a large scale, and the invention and consumer acceptance of the World Wide Web

stimulated critical consumer interest in the evolving Internet. The first dot-coms to create significant audiences were Internet search and indexing services, such as Yahoo! and Alta Vista. One notable milestone of the early dot-com era was the deployment of the banner ad, pioneered by Hotwired.com for Zima and AT&T in October 1994.

The Internet represents not just a unified global network for voice, data, and video, but also a fundamentally new digital infrastructure platform through which global commerce can occur.

After the commercialization of the University of Illinois-created Mosaic browser as Netscape in 1995, the Internet took off. Within a few short years, the dot-com bubble of the late 1990s to early 2000s gave rise to a number of notable failures, such as pets.com (selling dog food over the Web), Boo.com (fashion), and Excite@Home (an Internet portal). But it led to almost as many successes as failures, including pioneering successes such as Google, Amazon, eBay, and iTunes. It's a rare business that doesn't have a Web presence today, and an even rarer news service, advocacy group, or even political candidate.



eToys Sock Puppet

As this report documents, the influence of the commercial Internet has been far more enduring and transformative than one might have expected after the burst of the dot-com bubble in March 2000. In the mid- to late-1990s, one could not open up a business magazine or turn on the news without hearing about the amazing New Economy and how it was going to revolutionize both the economy and society.¹⁸ Kevin Kelly, editor of *Wired*, opined that, “The network economy will unleash opportunities on a scale never seen before on Earth.”¹⁹ Futurists Peter Schwartz and Peter Leyden wrote that “we are watching the beginnings of a global economic boom on a scale never experienced before ... a period of sustained economic growth that could eventually double the world’s economy every dozen years.”²⁰ Even business leaders succumbed to the hype. General Electric CEO Jack Welch proclaimed that, “commerce in the next decade will change more than it’s changed in the last hundred years.”²¹ Any company not embracing the Internet was, according to popular wisdom, doomed to extinction.

Yet when epochal transformation is the bar, reality is bound to disappoint. With initial financial returns from the dot-com startups failing to justify their lofty equity valuations, the dot-com bubble burst—marked principally by the crash of the NASDAQ Stock Market, which by 2002 had lost 60 percent of its peak value of 5,048.62 reached on March 10, 2000—and the mass euphoria of the New Economy quickly turned to gloom and doom. It became fashionable, even the norm, to believe that the New Economy was a flash in the pan, or a myth spun by an over-imaginative media. Stephen Roach, chief economist at Morgan Stanley, and one-time New Economy champion, turned viciously

on it, now seeing it as a “bubble-induced excess.” Indeed, piling on the Internet’s failure became a way to sell books and get on the speaking circuit. Indicting the Internet’s potential in a widely touted article later to become a book, Harvard Business School’s Nicholas Carr wrote in 2003, “As for information technology (IT)-spurred industry transformations, most of the ones that are going to happen have likely already happened or are in the process of happening.”²² But in reality, such dismissive perspectives were as lopsided as the earlier euphoric claims, and discounted many of the changes and innovations to be wrought by the Internet that were in fact just beginning. It turns out

that a brief interruption in the midst of an economic revolution is actually the norm. As technology-historian Carlota Perez describes in *Technological Revolutions and Financial Capital*, technology revolutions start with what she calls the “installation phase” when “new technologies erupt in a maturing economy and advance like a bulldozer disrupting the established fabric and articulating new industrial networks...At the beginning of that period, the revolution is a small fact and a big promise; at the end, the new paradigm is a significant force...ready to serve as a propeller of widespread growth.”²³ Perez argues that the second half of these technological revolutions, the “deployment period,” is when the fabric of the economy is rewoven and reshaped by the new technology system and when the technology becomes normal best practice.

The evolution of the Internet and its dot-com businesses, characterized by a boom-bust cycle followed by subsequent widespread diffusion and adoption, followed a trajectory not at all unlike the development of the telegraph, the railroad, or the automobile industries.

However, the turning point between the two phases is usually marked by a critical crossroads, often resulting in an economic downturn. This is exactly what occurred with the dot-com economy over the last 15 to 20 years. As the installation period ended in 2000, it did indeed represent a crossroads, when it became clear that some business models would thrive and others would die. However, now, during the deployment period, the Internet is well on its way to reshaping the economy and driving growth, as evidenced in part by the fact that, although the United States is just recovering from its worst recession in 60 years, productivity is approximately three times higher than in previous pre-Internet recessions.²⁴ In short, while the Internet revolution may not have lived up to the most extreme hype of the late-1990s in terms of its penetration into the economy and society, it has subsequently more than fulfilled its promise. And the next decade promises as much progress, if not more, than the last.

Indeed, the evolution of the Internet and its dot-com businesses, characterized by a boom-bust cycle followed by subsequent widespread diffusion and adoption, followed a trajectory not at all unlike the development of the telegraph, the railroad, or the automobile industries. Each of these transformative technological revolutions were marked by initial overshoot, as too much speculative capital flooded into the market, spawning too many entrants chasing too few opportunities, with marketplace competition subsequently sorting companies with winning strategies and business models from the losers. This process of industry restructuring and consolidation turns out to be quite common during the initial phases of new industries spawned by technological breakthroughs.

For example, in the “dot-dash” era from 1848 to 1852, the number of telegraph miles in the United States jumped from 2,000 to 23,000.²⁵ While the vast majority of companies that built the industry’s original infrastructure had failed by 1860, the cost of transmitting data had dropped to a penny a word and the telegraph became a vital tool of American business. Between 1870 and 1890, investment in the U.S. railroad industry quadrupled and work began on four trans-continental railroads. By 1897, one-quarter of the industry was in receivership, but a sturdy new commercial infrastructure remained and the amount of rail freight shipped grew consistently and significantly until after the creation of the Interstate Highway System.²⁶ Britain’s railway industry similarly collapsed in 1847, leading to massive bankruptcy and failures, but many more miles of rail were built in the United Kingdom from 1827 to 1847 than in the 20 years before.²⁷ The same story played out with the development of the U.S. automobile industry. While there were 253 auto companies in the United States in 1908, by 1920 there were just 108, and by 1929, 80 percent of cars were produced by the Big Three of Chrysler, Ford, and General Motors. Although hundreds of car companies went out of business in the 1920s, with failures just as spectacular as those witnessed during the dot-com bubble, these busts did not diminish the fact that the automobile industry was on the verge of revolutionizing America’s economy and society. Rather, it was just getting started.²⁸

For the latest transformative technology, three critical, inter-related factors led to the bursting of the dot-com bubble: 1) the initial technical infrastructure could not support the technology capabilities envisioned; 2) the expectations for the Internet’s initial impact, as with most technological revolutions, was overestimated; and 3) as a consequence of and compounded by the first two reasons, the excessive valuations of dot-com businesses contributed to many of them collapsing under the weight of the expectations heaped upon them.

A critical reason why the take-off of the Internet and dot-com companies occurred more slowly than initially anticipated was that the underlying technical infrastructure—particularly the speed of the Internet over the “last mile” to the home, but also the number of Internet subscribers—took time to develop. Internet pioneers were trying to build revolutionary businesses at a time when most subscribers connecting to the Internet were doing so using dial-up modems with a mere speed of 28.8 to 56 Kbps, half of Americans weren’t yet connected to the Internet at all, and hardly any Americans were connected to the Internet through mobile devices such as iPhones. In fact, at the start of the century, only 4.5 percent of U.S. households had broadband access.²⁹ In 2001, just 5 percent of the country’s fiber optic capacity was being used, signifying that while sufficient back-haul Internet infrastructure had been built out, the last mile to the home had not yet been.³⁰ In addition, a number of Internet technologies taken for granted today, including Web browsers, media compression algorithms, low-cost storage, low-cost Web design and construction, and Flash scripting, had not yet matured to the point of being ready for mass-market use.

Because the underlying Internet infrastructure had not been sufficiently diffused or adopted, subscribers lacked technologies, especially the Internet connectivity speeds, to fully access the Web services and functionalities envisioned by the Internet pioneers. Consider the case of Boo.com, a poster child for “dot-bomb” failures. As a start-up showered with \$100 million of venture capital in 1999, its goal was to sell designer clothes across 18 European countries. But since unmetered dial-up access was only then being introduced in Europe, few customers who looked at the Web site ever managed to make it as far as the checkout stage.³¹ Boo.com spent \$188 million in just six months in its effort to create a global online fashion store before going bankrupt in May 2000.³² If slow Internet speeds and relatively few Internet users made it difficult for shopping sites to thrive, it made it virtually impossible for early Web players, such as Broadcast.com, who were trying to offer video and multimedia services, to succeed. As *Wired* elegantly wrote about Broadcast.com’s failed business model, “Internet video before broadband was like pouring tar through a garden hose.”³³

What the failure of once dot-com luminaries such as Webvan.com, pets.com, or Broadcast.com masks is that the services those companies envisioned offering over the Internet have since come to fruition.

This led to a classic chicken-or-egg problem: Web companies (and their venture capital backers) became reticent to invest in new technologies and features knowing that consumers lacked the Internet access speeds to enjoy them; conversely, consumers and broadband providers were less inclined to demand higher Internet access speeds and invest in higher speed networks, respectively. This dynamic stunted broadband take-up and dot-com growth simultaneously. Companies asked, “Why develop a high-bandwidth intensive application like downloadable TV shows, telepresence, or telemedicine when few people would be able to access them at the needed speeds?” It was not until the mid- to late-2000s that high-speed broadband had been sufficiently developed, deployed, and adopted to support many of the business models originally envisioned a decade earlier.³⁴ For example, it is unlikely that YouTube’s user-generated content-based business model would have succeeded in the late 1990s because Internet access speeds were too slow for users to quickly upload or download massive amounts of video content.³⁵ Conversely, once a video streaming service like YouTube had enough subscribers to take off, its continued growth, and the growth of hundreds of similar Web companies, spurred consumers to want to upgrade their Internet speeds, leading to a virtuous circle of higher speeds at lower prices, better content and applications, etc. Of course, the declining cost of connectivity and technology components played a critical role in enabling new business models as well: between 2000 and 2010, the cost per gigabit (GB) of streaming video fell from \$193 to \$0.028, hard drive storage cost per GB fell from \$44.56 to \$0.07, monthly Web storage per GB fell from \$1,250 to \$0.15, and monthly Web hosting per GB fell from \$2.58 to \$0.0005.³⁶

Moreover, when it came to predicting the growth of the Internet, as is the case with most new technologies, pundits overestimated the initial rate of change and underestimated the amount of long-term impact. Indeed, most investors, entrepreneurs, and the public mistakenly thought the Internet was not like past innovations that took time to mature. As IT expert David Moschella has noted, “history says that the promise of IT is almost always farther off than it initially appears.”³⁷ Most expected the economy to be transformed over night, and when it was not, the bubble burst.

In fact, the explicit expectation that the Internet would transform the economy so quickly contributed to many venture-backed start-up companies commercializing the Internet receiving extremely high valuations. For example, late-1990s start-up Web grocer Webvan.com raised \$1.2 billion to sell groceries over the Internet, but within just two years burned through \$1 billion in cash, saw its stock plummet from \$30 to 6 cents a share, and went bankrupt in 2001.³⁸ Start-up InfoSpace.com reached a price of \$1,305 per share in March 2000, but by April 2001 its stock had crashed to \$22 a share.³⁹ Commerce One reached \$600 a share before the dot-com bubble crashed, with the company going bankrupt in 2004. (Tellingly, Super Bowl XXXIV in January 2000 featured 17 dot-com companies that each paid over 2 million dollars for a 30-second commercial spot; by contrast, in January 2001, just three dot-coms bought advertising spots during Super Bowl XXXV.)⁴⁰



Truck of grocery delivery dot-com Webvan

When the vision of overnight economic transformation was not realized, companies’ valuations plummeted. As David Kirsch and Brent Goldfarb of the University of Maryland have argued, the bursting of the dot-com bubble was largely the result of exceedingly optimistic expectations and thus over-capitalization of many dot-com companies that ultimately led them to collapse under their own weight.⁴¹ As they write, “In the mistaken pursuit of Get Big Fast, many good opportunities were sold to investors and the public as big opportunities. As the bubble burst, valuations were brought into line with the realistic scale of the typical online venture.”⁴²

Although the story of the dot-com crash was headlined by the spectacular failure of a few overly-capitalized start-ups, such as Webvan, pets.com, eToys.com, TheGlobe.com, iWon.com, Bid.com, Geocities.com, and plenty of others, Kirsch and Goldfarb found that the five-year survival rate of the approximately 50,000 companies, mostly dot-coms, that solicited venture capital to exploit the commercialization of the Internet was actually 48 percent.⁴³ This survival rate is higher than most pundits would have us believe and is similar to, or even higher than, that associated with the introduction of other general purpose technologies, and is certainly considerably higher than the typical survival rates for most new businesses. As Kirsch and Goldfarb argue, “Standing in stark contrast to the popular picture of the dot-com era consisting of a boom phase followed by an unprecedented bust, our findings suggest underlying continuity in the exploitation of entrepreneurial opportunities arising from the diffusion of a new general purpose technology.” Examples of dot-com start-ups that may have failed to achieve their grandest visions but that survive today include Lycos, Theknot.com, Tripod, iVillage, AltaVista, and even Salon.com and The Motley Fool.⁴⁴ And of course, several start-ups—Amazon, eBay, Google, Yahoo!, Expedia, etc.—stand out as dot-coms that delivered on their promise to revolutionize their respective industries. (Indeed, the market capitalizations of eBay and Amazon are higher today than in 1999.)

The 48 percent five-year survival rate of dot-coms is higher than most would expect, is similar to or higher than that associated with the introduction of other general purpose technologies, and is certainly considerably higher than typical survival rates for most new businesses.

An excellent example of a dot-com start-up that failed to meet extremely high initial expectations but yet survives today as a going concern with a healthy business model is Brivo Systems.⁴⁵ Founded in 1999, Brivo Systems raised over \$25 million in venture capital for a concept to build a smart mailbox for the digital age, the Smartbox.⁴⁶

With an embedded modem and wireless Internet connection, the Smartbox was designed as a secure receptacle to receive residential package deliveries (especially from the anticipated boom in e-commerce) able to send an e-mail notification to owners once packages were safely delivered to the Smartbox (thus closing the chain of custody between online retailers, delivery companies, and the customer). Flush with capital, within 18 months Brivo Systems grew from four co-founders to a staff of almost 70. After online shopping failed to immediately take-off and the stock market bubble popped, the company slimmed down considerably and abandoned its business-to-consumer (B2C) approach. However, Brivo was one of the first companies in the world to figure out how to manage controlled access to remote locations via the Internet, received several

patents for this and related technology, and survives today as a robust business-to-business (B2B) company with a suite of Web-hosted, enterprise-level building access control solutions for corporations, universities, and government agencies.⁴⁷

But what even the spectacular failure of once dot-com luminaries like Webvan.com, pets.com, or Broadcast.com masks is that the services those companies envisioned offering over the Internet have indeed since come to fruition, even if delivered by competitors or other companies that crafted a more effective or sustainable business model. For example, out of a group of 72 dot-com companies that Hoovers (a business information service) identified as having failed by August 2001, by December 2003 over 60 percent of those Web companies were back in business, either as redirects to another Web site (pets.com was subsumed by petsmart.com) or as the brand name of other companies (allwall.com became art.com).⁴⁸



Brivo Systems' Smartbox

A final factor in the dot-com stock collapse is that many investors of the era did not appreciate just how extensively and quickly existing brick-and-mortar companies would transform themselves into brick-and-click companies to compete with, and sometimes outcompete, start-up pure-plays. For instance, Webvan.com may have failed, but Peapod.com, by supermarket company Giant, offers consumers nearly identical service. Amazon succeeded, but its biggest competitor has been Walmart.com. Netbank (one of the first all-Internet banks) may have failed, but virtually all banks today offer their customers free online banking. And while start-ups such as Commerce One may have failed in their gambit to leverage the Internet to help Fortune 1000 companies streamline their procurement processes (competitor Ariba.com fared somewhat better, though its market capitalization fell from a high of \$30 billion to \$1 billion today), the reality is that almost all Fortune 1000 firms now use Internet procurement. In fact, the Internet has subtly transformed a number of “old economy” industries as firms co-opted it, subsuming the Internet into their business processes and value chains. As C.K. Prahalad and M.S. Krishnan write

in *The New Age of Innovation*, to innovate, firms must embed the Internet in their IT architecture, and connect it to external devices and sensors such as RFID.⁴⁹ This is one reason why U.S. IT employment, while bottoming out in 2003, fully recovered by 2005, and by 2007 was 6.9 percent higher than the 2001 peak.⁵⁰

Even when dot-coms failed they often left behind valuable assets. While much of the fiber optic cable laid in the early part of the 2000s remained unutilized for many years, the deployment of so much fiber led to a decline in data transport costs, enabling new, higher bandwidth-requiring applications and companies like YouTube to succeed. Today, all that fiber, and more, is now lit. In addition, even the outright failures in many cases led to overall economic growth. One study found that even dot-com failures can have significant economic benefits on local regions, as employees who are laid off go on to start successful firms or help existing firms become more competitive.⁵¹

Thus, the reality is that the Internet has indeed fulfilled its initial promise of transforming both the economy and society, thanks to a combination of both the dot-com success stories and the fact that established industries and companies have substantially integrated the Internet into their business operations. Just how large is the global Internet economy? The following section explores this question.



This section provides a comprehensive global overview of the types of Web sites on the Internet; looks at the evolution of .com domain names; identifies the leading online businesses; and then analyzes the Internet economy first on a global level, and then at a regional level, looking specifically at the Internet economy in the United States, Europe, Asia, and the developing world, including identifying the countries that lead the world in e-commerce.

TYPES OF WEB SITES

In general, commercial Web sites fall into at least one of eight possible categories: 1) search and portal, 2) storage and infrastructure, 3) information, 4) entertainment, 5) communication and social networking, 6) e-commerce, 7) brand and personal identity, and 8) crime.

First, search and portal sites like Google, Yahoo!, Live, and Baidu (the leading Chinese search engine), make up six of the top ten sites globally in terms of hits. This is not surprising since most people use search engines to find the information they are looking for.

Second, storage and infrastructure sites that provide file hosting such as Rapidshare and Hotfile, ad networks like Doubleclick and Clicksor, and content delivery networks like Akamai make up the most heavily trafficked destinations on the Internet.

Third, informational Web sites that principally host information, even if it is updated frequently, include sites such as the Internet Movie Database (imbd.com) and TV.com. A host of other sites maintain archives, most notably newspaper and magazine Web sites such as nytimes.com, CNN.com, and the

Weatherchannel.com. Other informational Web sites include the tens of thousands of blog sites on which users publish information on a wide variety of topics. In Korea, for example, 32 percent of Internet users age six and over have their own blogs and have actively managed their blog within the last month (up by 1.5 percent compared with 2008).⁵² Many analysts use a variety of categories to segment these sites, such as sports, health, news, etc.

While 21 million .com domain names were registered between 1985 and 2000, almost three times that amount, 57 million, were registered in the decade from 2000 to 2010, bringing the current number of global .com domain names close to 80 million.

Fourth, entertainment sites, including free and open video sharing sites such as YouTube and its Chinese equivalent Tudou, as well as commercial streaming services such as Netflix and Hulu, are popular online destinations. Entertainment sites include specialized Web sites such as NBA.com and NFL.com,

as well as gaming sites like poker.com and World of Warcraft. These sites are increasingly leveraging video. For example, in December 2009, Hulu viewers watched more than 1 billion videos for a combined 5.8 billion minutes (97 million hours), up 140 percent versus a year ago.⁵³ This category also includes sites hosting pornography, a number of which are in the top 100 sites globally in terms of traffic.

While 50 percent of Internet users spoke English as their primary language in 2000, by 2009 only one-quarter did.

Fifth, social networking and communication sites like Facebook, LinkedIn, MySpace, and Mixi (the leading Japanese social networking site) help users stay in touch with friends and professional colleagues. Sites like Twitter and qq.com, a Chinese instant messaging site, help users easily communicate with one another. Sites like Flickr and Photobucket help users share pictures with each other and services such as Scribd and Google Docs help users share and collaborate on documents.

Sixth, sites engaged in selling products or services commercially include both “Web pure-play” (e.g. online only) companies such as Amazon, eBay, eSurance, Mint.com, and Taobou (the “eBay of China”), but also the millions of Web sites of “brick-and-click” businesses that both conduct business over the Internet and maintain a physical retail presence, such as BarnesandNoble.com or Borders.com. (The term “brick-and-mortar” throughout this report refers to businesses that were once or are still today characterized mainly by a physical retail presence. If they have an online presence, it is informational and not transactional in nature. However, today many businesses that were once brick-and-mortar only have added a transactional online presence, such as Gap.com or JCrew.com, and have become “brick-and-click” stores for purposes of this report.)

Seventh, in terms of total number of Web sites, the largest category is for the Web sites of companies that have established a presence on the Web for customer service or general brand promotion and of individuals who have established Web sites to promote individual identity on the Web. (These Web sites are thus predominantly informational and non-transactional in nature.) Businesses ranging in size from the lone consultant or neighborhood pizza shop to the world’s largest company, Royal Dutch Shell, maintain Web sites to communicate with the public and support their brands. For example, the pharmaceutical firm AstraZeneca owns acidreflux.com, the greeting card company Hallmark owns easter.com, and the international food company Nestle owns icecream.com and meals.com. (The point here is that large corporations like Hallmark or Nestle actually operate multiple different Web sites; some of which to be sure are transactional in terms of selling goods or services online, but many of which are informational.) Personal Web sites and blogs play an important role in helping people find and learn more about each other. While many famous individuals have their

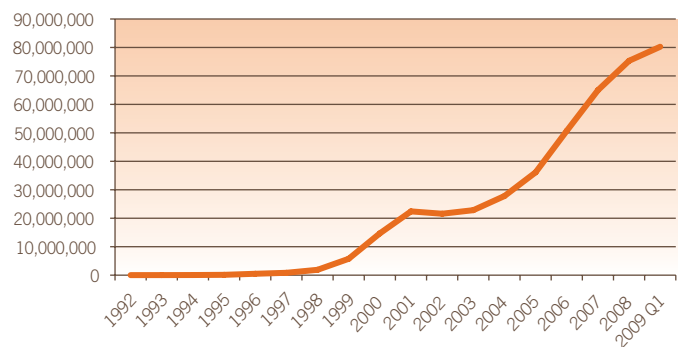
own sites, such as Arod.com, the site for the Yankee’s baseball star Alex Rodriguez, and Madonna.com, for singer Madonna, millions of not so famous “John Smith’s” have their own .com domain name (although JohnSmith.com is a classified ad site).

Finally, the last category includes sites that in the old economy would be termed back alley businesses, or businesses that operate either at the edge of the law or in violation of it. These include phishing Web sites (sites that try to get a consumer to believe that they are on a legitimate site when in fact they are not) and piracy Web sites, such as Piratebay, isoHunt, and ZLM.com (the Russian movie piracy site), all of which provide access to content in violation of content owners’ wishes. While many of these businesses are clearly violating the law, they continue to exist in part because the authorities in the nations they are hosted in turn a blind eye to them and in part because other nations do little to block their citizens’ access to them.⁵⁴

THE EVOLUTION OF .COM DOMAIN NAMES

Over the last 25 years, the use of .com domain names has rapidly expanded from a specialized name space for the high-tech community to an integral part of the global economy. Beginning with Symbolics.com in 1985, today there are over 80 million .com domain names and more than 200 million domain names in total.⁵⁵ Despite the collapse of the dot-com bubble, since the end of 2000 the number of registered .com domain names has increased dramatically, with 668,000 new .com domains registered, on average, every month.⁵⁶ Moreover, while 21 million .com domain names were registered between 1985 and 2000, in just the ten years since 2000, 57 million more have been registered (see figure 1).

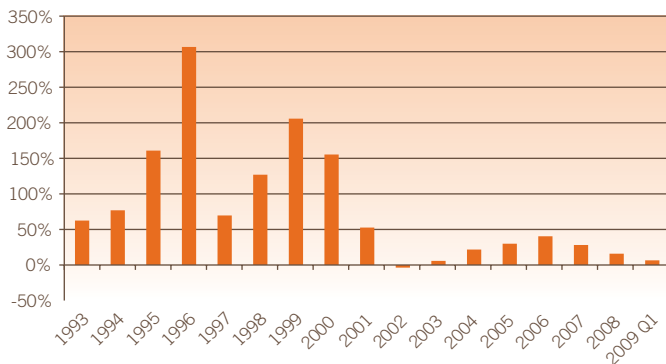
Figure 1: Growth of .com domain names globally, 1992-2009



Source: zooknic.com⁵⁷

Although the number of .com domain names continues to increase, each year new .com registrations constitute a declining percentage of the total. But this is in part a reflection of the fact that the base of registered .com domain names had already grown so large. As figure 2 shows, annual growth in .com domain names as a percentage of all domain names peaked in 1996 with growth rates over 300 percent, yet growth continued in 2008 at a healthy 20 percent.

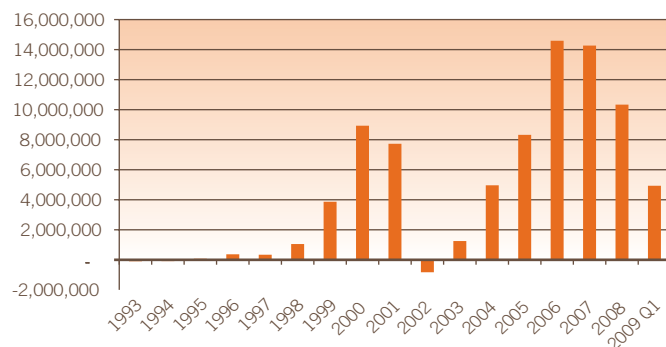
Figure 2: Growth in .com domain names as percent of .com domain names globally, 1993-2009



Sources: *zooknic.com*⁵⁸ and author's calculations

The global recession has done little to deter the growth of total registrations of .com domain names, with the number of registered domain names increasing every month since 2007 by 556,000 and a total of 8.2 million new .com domain names being created since the first quarter of 2008 (see figure 3). Internet traffic to .com domains has also increased throughout 2008 and 2009. According to VeriSign, the global operator for .com and .net domains, the overall query load (individually accessed Web pages) per day during the second quarter of 2009 increased by 29 percent from 38 billion to 49 billion queries, reflecting the Internet's growth and its hundreds of millions of new users worldwide.⁵⁹ Indeed, since 2004, when VeriSign first started publishing its Domain Name Industry Briefs, the per day query load has increased by 250 percent (from 14 billion in the first study).⁶⁰ Although increased Internet traffic to .coms does not necessarily mean an increase in economic activity online, given the commercial nature of many .com domains such increases likely reflect the growing importance of the Internet economy.

Figure 3: Annual global growth in .com domain names, 1993-2009

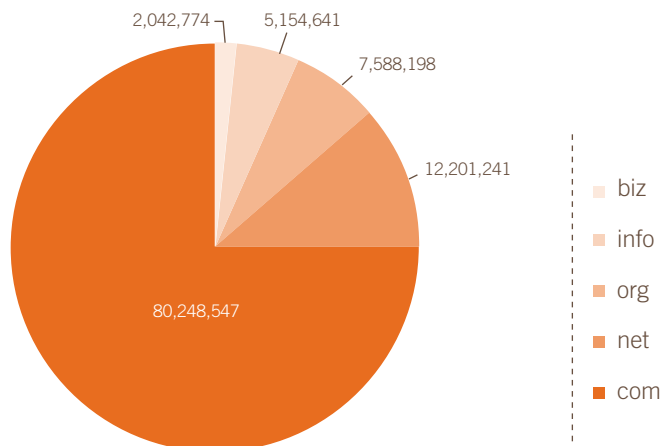


Sources: *Zooknic.com*⁶¹ and author's calculations

Web sites with .com domain names account for the lion's share of online content, making up the vast majority of top level domain names, the highest level of the hierarchy in the Internet Domain Naming System. As figure 4 illustrates, the .com domain accounts for over three-fourths of total TLDs. Not only does .com represent the largest share of TLDs, .com has grown

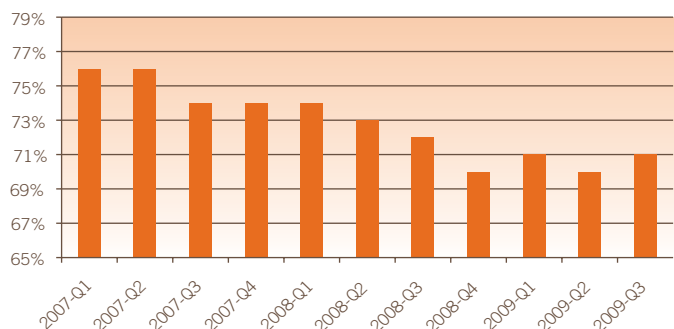
faster since 2005 than any other TLD. Between 2005 and 2009, .biz, .info, and .org grew by 88, 55, and 129 percent respectively, while .com grew by 140 percent. And despite all the talk of the Internet economy being dizzyingly volatile, the persistence of most .com domain names is reasonably stable. In the first half of 2009, 70 percent of the .com domain names that were up for renewal were renewed, down only slightly from 2008 (see figure 5). Throughout the course of the Internet economy, almost 400 million .com domain names have been created with roughly a quarter of those still active.⁶²

Figure 4: Total domain names by TLD, 2009



Source: *VeriSign, 2009*⁶³

Figure 5: .Com/.Net registry renewal rates, 2007-2009



Source: *VeriSign, 2009*⁶⁴

ONLINE BUSINESSES

In most developed nations today, virtually every business has at least an online presence, whether it be a brick-and-mortar (traditional business), a brick-and-click (a business that both sells online as well as at a physical location), or a pure-play (an online business with no physical counterpart) enterprise.⁶⁵

Within the United States, the largest segments online in 2007 by number of Web site visits were search and email (23.2 percent),

Table 2: Most popular Web sites internationally by category

News	Business	Shopping	Health	Sports
news.yahoo.com	finance.yahoo.com	amazon.com	nih.gov	espn.com
bbc.co.uk	paypal.com	ebay.com	webmd.com	sports.yahoo.com
cnn.com	alibaba.com	netflix.com	health.yahoo.com	cricinfo.com
news.bbc.uk	ezinearticles.com	amazon.co.uk	focusonwomenshealth.com	nba.com
news.google.com	bankofamerica.com	walmart.com	ncbi.nlm.nih.gov	nfl.com
nytimes.com	istockphoto.com	bestbuy.com	mayoclinic.com	sportsillustrated.com
weather.com	online.wsj.com	ikea.com	walgreens.com	livescore.com
my.yahoo.com	skype.com	target.com	nlm.nih.gov	msn.foxsports.com
huffingtonpost.com	ups.com	newegg.com	drugs.com	soccernet.espn.go.com
msnbc.msn.com	constantcontact.com	stores.ebay.com	weightwatchers.com	skypesports.com

Source: *www.Alexa.com*⁶⁷

entertainment (19.6 percent), commercial (15.3 percent), social networking (9.2 percent), and news and media Web sites (3.5 percent).⁶⁶ Table 2 shows the most globally-popular Web sites across five predetermined categories—news, business, shopping, health, and sports—as defined by Alexa.com, an international Web site research firm.

The most popular Web sites vary by nation. In many nations, however, the most visited Web sites are those of American firms. For example, in Albania, the top five Web sites in terms of traffic are Facebook, Google, YouTube, Yahoo!, and Windows Live, in that order.⁶⁸ In Nepal, the order switches, with Google first, then Facebook, Google Nepal, Yahoo!, and Windows Live. In Sudan, it's the same five, only in this order: Google, Facebook, Yahoo!, Windows Live, and YouTube. In Iran, Google and Yahoo! are numbers one and two, with three blog sites ranked third, fourth, and fifth: two free Iranian blogs, Blogfa.com and mihanblog.com, and a U.S. site, blogger.com, ranked fifth. However, once one gets beyond the top five to ten sites, there is considerable diversity in the top 100 sites in each nation. For example, the United States and Mexico share 39 sites that are both on the nations' top 100 sites (as measured by visitors), but the United

States and China share only eight sites. And while the top 15 most popular Web sites are the same across most nations, in general, the remaining top-ranked Web sites differ from one nation to another.⁶⁹

Amongst the 100 most popular Web sites in 2009, pure-play Web sites comprise the overwhelming majority: 94 percent of the top Web sites were pure-plays, but only 6 percent were brick-and-clicks. (See table 3 for the full list of the top 100 most popular sites.) Search, social networking, and entertainment sites account for the majority of pure-plays. Such enterprises receive billions of dollars in online advertising revenue and employ hundreds of thousands of employees. For example, in 2007, the top five search engines (Google, Yahoo!, AOL, Microsoft, and Ask.com) together employed close to 40,000 individuals and generated roughly \$30 billion in revenue.⁷⁰ Yet employment figures do not fully capture the full value of non-retail pure-plays to the global economy. These firms tend to have high revenue-to-employee ratios, meaning they are able to create a disproportionate amount of value from their employees. For example, in 2007, the top five search engines generated \$790,000 of revenue per employee, far exceeding the revenue per employee ratios of the average firm.

Table 3: 100 most popular Web sites, by pure play or brick-and-click, 2009

Rank	Site	Pure-play	Brick-and-click	Rank	Site	Pure-play	Brick-and-click
1	google.com	x		42	go.com	x	
2	facebook.com	x		43	bbc.co.uk		x
3	youtube.com	x		44	doubleclick.com	x	
4	yahoo.com	x		45	sohu.com	x	
5	live.com	x		46	1e100.net	x	
6	wikipedia.org	x		47	photobucket.com	x	
7	blogger.com	x		48	orkut.com.br	x	
8	baidu.com	x		49	hi5.com	x	
9	msn.com	x		50	pornhub.com	x	
10	yahoo.co.jp	x		51	google.com.mx	x	
11	qq.com	x		52	conduit.com	x	
12	google.co.in	x		53	apple.com		x
13	twitter.com	x		54	bp.blogspot.com	x	
14	myspace.com	x		55	orkut.com	x	
15	google.cn	x		56	ask.com	x	
16	sina.com.cn			57	kaixin001.com	x	
17	google.de	x		58	youporn.com	x	
18	amazon.com	x		59	youku.com	x	
19	wordpress.com	x		60	google.ca	x	
20	microsoft.com		x	61	megaupload.com	x	
21	ebay.com	x		62	espn.go.com		x
22	bing.com	x		63	mediafire.com	x	
23	taobao.com			64	cnn.com		x
24	google.co.uk	x		65	cnet.com	x	
25	google.fr	x		66	about.com	x	
26	rapidshare.com	x		67	xvideos.com	x	
27	163.com			68	soso.com	x	
28	yandex.ru	x		69	ebay.de	x	
29	google.co.jp	x		70	imageshack.us	x	
30	google.com.br	x		71	adobe.com		x
31	mail.ru	x		72	google.ru	x	
32	fc2.com	x		73	rakuten.co.jp	x	
33	flickr.com	x		74	orkut.co.in	x	
34	livejasmin.com	x		75	tube8.com	x	
35	vkontakte.ru			76	google.com.tr	x	
36	google.it	x		77	megavideo.com	x	
37	imdb.com	x		78	4shared.com	x	
38	craigslist.org	x		79	uol.com.br	x	
39	google.es	x		80	google.co.id	x	
40	linkedin.com	x		81	livejournal.com	x	
41	aol.com	x		82	ameblo.jp	x	

Rank	Site	Pure-play	Brick-and-click
83	livedoor.com	x	
84	dailymotion.com	x	
85	files.wordpress.com	x	
86	tianya.cn	x	
87	redtube.com	x	
88	xhamster.com	x	
89	mixi.jp	x	
90	google.com.au	x	
91	thepiratebay.org	x	

Rank	Site	Pure-play	Brick-and-click
92	tudou.com	x	
93	renren.com	x	
94	hotfile.com	x	
95	mozilla.com	x	
96	odnoklassniki.ru	x	
97	amazon.de	x	
98	weather.com		x
99	google.pl	x	
100	clicksor.com	x	

Source: Alexa⁷¹

According to the OECD *ICT Firm Rankings*, the leading Internet firms (firms that sell all or the overwhelming majority of their products and services online) are some of the most successful businesses of the past decade. As shown in table 4, the top ten Internet firms in the OECD's study—Amazon, Google,

AOL, Yahoo!, IAC/Interactive, eBay, E*TRADE, Expedia, TD AMERITRADE, and Yahoo! Japan—together earned \$58 billion and employed 100,000 individuals in 2006, with income growing 77 percent a year since 2000.⁷²

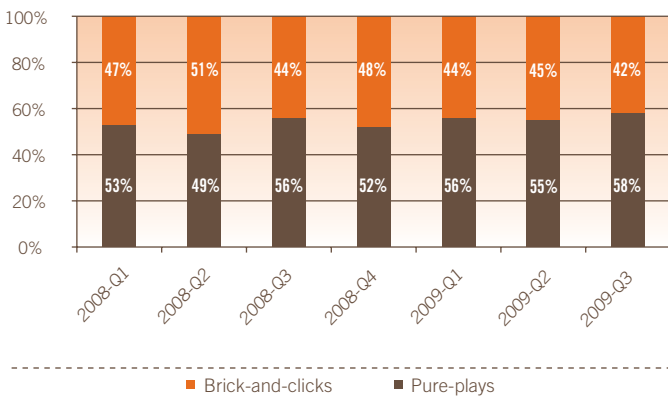
Table 4: Top 10 Internet firms

Company	Country	Revenue 2000 (\$B)	Revenue 2006 (\$B)	Revenue 2007 (\$B)	Employees 2000	Employees 2006	R&D 2000 (\$M)	R&D 2006 (\$M)	Net income 2000 (\$M)	Net income 2006 (\$M)
Amazon	U.S.	\$3,122	\$10,711	\$14,835	\$7,500	\$14,400	\$269	\$662	-\$1,411	\$190
Google	U.S.	\$19	\$10,605	\$16,594	\$1,000	\$13,786	\$11	\$1,229	-\$15	\$3,077
AOL LLC	U.S.	\$7,605	\$7,866	\$5,181	\$15,000	N/A	N/A	N/A	\$1,855	\$1,923
Yahoo!	U.S.	\$1,110	\$6,426	\$6,969	\$3,259	\$11,400	\$111	\$688	\$71	\$751
IAC/Interactive	U.S.	\$2,918	\$6,278	\$6,373	\$20,780	\$26,000	N/A	N/A	-\$148	\$46
eBay Inc.	U.S.	\$749	\$5,970	\$7,672	N/A	\$13,200	\$75	\$495	\$90	\$1,126
E*TRADE	U.S.	\$2,061	\$3,840	\$2,223	N/A	\$4,027	N/A	N/A	N/A	\$629
Expedia	U.S.	\$222	\$2,238	\$2,665	N/A	\$6,600	N/A	\$121	-\$78	\$245
TD AMERITRADE Holding	U.S.	\$516	\$2,139	\$2,632	N/A	\$3,947	N/A	N/A	-\$91	\$527
Yahoo! Japan	Japan	\$53	\$1,493	\$2,225	\$196	\$2,534	N/A	N/A	\$1	\$49
Total		\$18,375	\$57,566	\$67,369	\$47,735	\$95,894	\$466	\$3,195	\$274	\$8,563

Source: OECD *Information Technology Outlook*, 2008⁷³

Pure-play retail Web sites appear to have fared better in the economic downturn than brick-and-click Web sites. In Q3 2009, pure-plays represented 58 percent of the total retail value of global e-commerce, their highest share in history (see figure 6).⁷⁴ Although only 15 percent of the 100 largest U.S. companies in e-commerce retail sales were pure-plays, they represented over one-quarter of profits from the top 100 Web sites.⁷⁵ And although pure-plays represent just one-fifth of the top 20 most profitable online retail firms, they make up close to one-third of total profits.⁷⁶ Interestingly, pure-plays made up a greater number of the top 100 online retail businesses in 2001 even though they represented a smaller percentage of total revenue than in 2007. One likely reason for this is that the dot-com bust of the early 2000s helped weed out the unprofitable pure-plays that had entered the market, leaving behind leaner, more competitive firms that gained market share.

Figure 6: Percent of global online retail sales by pure-plays and brick-and-clicks



Source: comScore⁷⁷

THE GLOBAL INTERNET ECONOMY

The United States was the first to develop the dot-com economy, in large part because the Internet was first developed here, but also because early on the United States led in Internet access (partly because in other nations consumers paid by the minute for Internet access) and because many innovative dot-com startups were developed in the United States. Indeed, as late as 2005, over 50 percent of the world's domain names were based in the United States, 5.5 times more than in the second place country, Germany, with 8 percent.

However, in the past decade the dot-com economy has grown significantly in other parts of the world. In many European and Asian nations (particularly Japan and Korea) the number of domain names has grown rapidly, in part because of high broadband penetration rates and in part because these nations have invested heavily in digital literacy and infrastructure. And as Internet access both from desktops and mobile devices moves from the exception to the norm, developing countries are increasingly cashing in on the value of wireless transactions. These days, developing nations are the countries experiencing

the most rapid growth in new Internet users. In fact, while the top ten emerging markets had less than one-third the number of Internet users as the top ten developed markets in 2001, by 2008 emerging markets had more.⁷⁸ For example, while the United States added 9.8 million Internet users in 2007, China added 73 million.⁷⁹

While the Internet economy is generally thought of as enterprises selling to consumers, the vast majority of e-commerce is actually comprised of businesses selling to other businesses; in 2007, roughly 90 percent of global e-commerce was B2B.

Assessing International E-commerce Leadership

Assessing which nations lead in e-commerce is not a straightforward task for two reasons. First, there is a lack of comparable and complete data between nations. Second, there is no clear agreement on which e-commerce measures should be included and at what weights. Having said that, this report identifies seven variables that appear to be the most important in assessing international e-commerce leadership: retail e-commerce as a share of GDP; percent of citizens who have purchased online; percent of firms purchasing online; percent of firms with a Web site; number of domain names per number of firms; secure servers per 100,000 inhabitants; and overall online sales and purchases as a share of total sales and purchases (B2B and B2C turnover). Data on all seven indicators were not available for all nations. Therefore, our analysis of e-commerce leaders includes nations where data on at least four indicators were available. This amounted to 30 nations (see table 5). Our analysis weighs each variable to account for the relative importance of each.⁸⁰ For example, because B2B e-commerce is much larger than B2C e-commerce, B2B variables received a higher weight.

Because nations' overall scores are sensitive to the weights assigned to the seven variables, with certain nations shifting rank based on even slight adjustments to the relative variable weights, this report provides countries' ranks in groups from 1 to 5. The four nations leading in e-commerce are Denmark, Sweden, the United Kingdom, and the United States (with an average group score of 136). The next group includes Germany, Norway, and Switzerland (with an average group score of 123). The third tier includes Canada, Austria, the Netherlands, Ireland, New Zealand, Australia, Japan, and Finland (with an average group score of 106). The fourth includes Korea, Luxembourg, Belgium, the Czech Republic, and France (with an average group score of 69). And the fifth group includes the Slovak Republic, Hungary, Spain, Portugal, Greece, Poland, Turkey, Italy, and Mexico (with an average group score of 6). Developing nations such as China and India, had full data been available, would likely have scored in this bottom group as well.⁸¹

Some of these results are not surprising, particularly the make-up of the nations in the bottom group. In most of these nations

Internet use is low. Moreover, in many nations credit card usage is limited and postal systems are not necessarily reliable. In addition, lower wages in some of these countries mean that it is sometimes cheaper for companies to have individuals do the work of taking orders and processing them than for companies to invest in the costs of computers, software, servers, and Internet access.

However, there are a number of surprises with these results. The first is that broadband leadership does not strongly correlate

with leadership in e-commerce. The two leading nations in the world on broadband, Japan and Korea, score in the 3rd and 4th groups, respectively. In general, Japanese and Korean businesses have lagged behind in adopting IT in general, and e-commerce in particular. A second is that overall ICT investment is also not strongly correlated to e-commerce leadership. For example, Denmark is a world leader in e-commerce, but ranks 22nd among 40 nations in ICT investment as a share of GDP.⁸² Conversely, Japan ranks third in ICT investments, but lags in e-commerce.

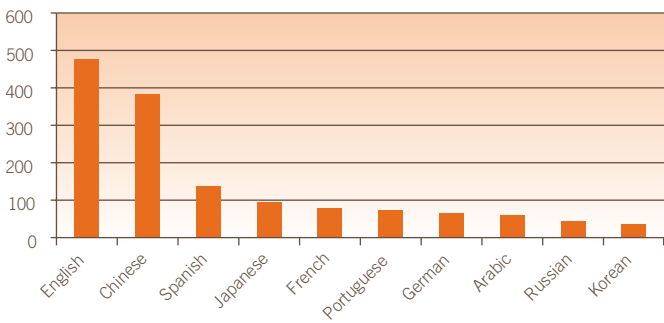
Table 5: E-commerce leadership⁸³

Country	Retail as a percent of GDP	Percent of citizen who have purchased online	Percent of firms purchasing online	Domain names per firms	Percent of firms with Web sites	Secure servers per 100,000 people	E-turnover as a percent of total turnover	Grouping
Denmark	0.97%	43%	38%	5.4	84%	96	22%	1
United Kingdom	2.70%	44%	47%	4.5	75%	85	15%	1
Sweden	1.40%	39%	50%	3.3	89%	72	18%	1
United States	0.95%	34%	N/A	9.3	80%	114	16%	1
Norway	0.95%	48%	44%	4.8	72%	78	21%	2
Switzerland	0.70%	32%	57%	9.7	90%	93	9%	2
Germany	1.30%	41%	52%	6.5	78%	51	15%	2
Ireland	0.40%	26%	54%	1.7	64%	63	26%	3
Canada	0.97%	30%	65%	1.6	70%	87	N/A	3
New Zealand	N/A	31%	66%	1.3	59%	91	N/A	3
The Netherlands	0.97%	43%	40%	3.5	80%	97	12%	3
Iceland	N/A	32%	35%	1.3	77%	155	10%	3
Australia	N/A	42%	54%	4.0	55%	90	12%	3
Japan	1.30%	52%	36%	1.0	84%	44	14%	3
Austria	1.00%	26%	34%	12.6	78%	45	11%	3
Finland	N/A	32%	19%	3.3	81%	63	18%	3
Korea	0.84%	44%	43%	N/A	58%	10	15%	4
Luxembourg	N/A	37%	23%	2.9	63%	85	N/A	4
Belgium	1.30%	15%	34%	2.9	72%	23	10%	4
Czech Republic	N/A	8%	26%	N/A	71%	13	15%	4
France	1.00%	26%	18%	2.3	57%	16	13%	4
Slovak Republic	N/A	10%	9%	1.3	70%	5	11%	5
Hungary	N/A	7%	7%	1.5	47%	7	14%	5
Portugal	0.30%	6%	20%	0.9	42%	10	12%	5
Spain	0.40%	13%	19%	0.9	45%	16	9%	5
Greece	0.10%	5%	9%	8.0	60%	6	2%	5
Poland	N/A	11%	11%	1.8	53%	7	7%	5
Turkey	N/A	1%	0%	1.3	46%	5	N/A	5
Italy	0.40%	7%	12%	4.0	57%	9	2%	5
Mexico	N/A	4%	2%	0.1	N/A	1	N/A	5

Languages on the Internet

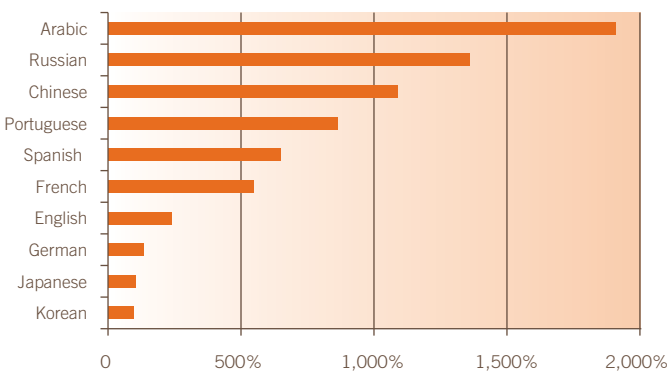
While over 50 percent of Internet users spoke English as their primary language in 2000, by 2009 only one-quarter did, with Chinese users quickly catching up, and accounting for 22 percent of users (see figure 7).⁸⁴ Indeed, while the number of English-speaking Internet users increased by 237 percent from 2000 to 2009, the number of Chinese-speaking Internet users increased by over 1,000 percent over that timeframe (see figure 8).

Figure 7: Millions of Internet users by primary language, 2009



Source: *www.Internetworldstats.com*⁸⁵

Figure 8: Growth in Internet use of select languages, 2000-2009



Source: *www.Internetworldstats.com*⁸⁶

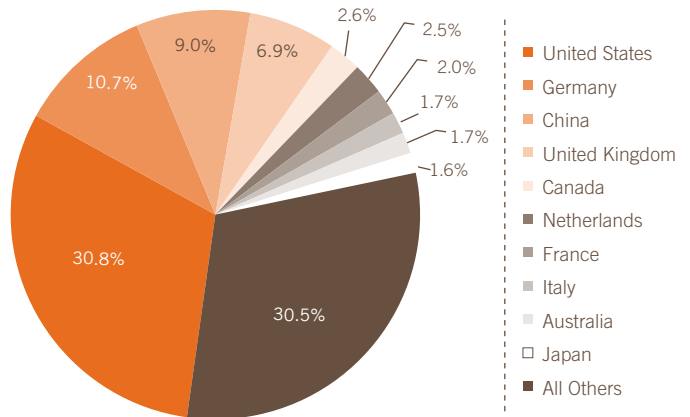
Domain Names

By 2009, only about one-third of the 182 million domain names worldwide were registered in the United States.⁸⁷ That being said, the United States is still by far the largest source of domain names, with a greater number of domain names than the second through sixth place countries combined.

Internet domain names are still heavily concentrated in a few nations. In 2009, the top ten nations, the United States, Germany, China, the United Kingdom, the Netherlands, Canada, France, Australia, Italy, and Japan, accounted for close to 70 percent of total domain names (see figure 9) despite the fact that these nations account for just 30 percent of the global population.⁸⁸ (See Appendix A for the percentage allocation of domain names by OECD countries.) However, a more accurate measure of the

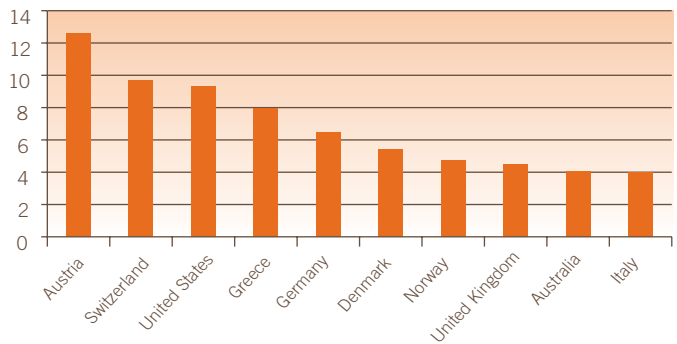
intensity of a country's dot-com activity is to measure the total number of domain names within a nation compared to its total number of firms. As figure 10 shows, when comparing the ratio of domain names to total enterprises, the United States now ranks third behind Austria and Switzerland.

Figure 9: Top ten countries accounting for largest share of Internet domain names, 2008



Source: *OECD*⁸⁹

Figure 10: Top ten countries by ratio of Internet domain names to firms, 2008



Source: *OECD, the World Bank*⁹⁰

Despite the concentration of domain names within several countries, the dot-com economy is becoming more global. While 70 percent of domain names are located in the top ten countries, 42 million are located elsewhere, more than double the number in 2005. Furthermore, many U.S.-based dot-com firms have strong customer bases abroad. For example, Google, Amazon, Symantec, and Yahoo! earn 48, 45, 47, and 42 percent, respectively, of their revenues outside the United States, for a total of \$20 billion in 2007.⁹¹ Indeed, for several U.S. dot-coms, the majority of their users are non-Americans. Eighty-nine percent of Google's page views come from outside the United States and Microsoft and Yahoo! respectively get 75 and 67 percent of their hits from abroad.⁹²

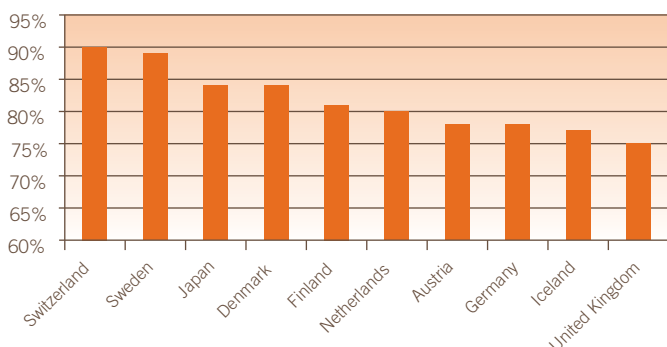
Hosts per Domain Name

An Internet host is a device connected to the Internet with a unique IP address. Internet hosts provide services such as Web, e-mail, or file transfer protocol (FTP) and as such are a good indicator of the growth of the Internet economy. As a greater number of people access the Internet, the number of hosts needed to provide a stable level of service increases. According to the OECD, over the last decade, the number of Internet hosts has increased rapidly, from less than 30 million to over 540 million, or 1,700 percent (33 percent annually). However, not all hosts use a .com domain name; the majority of hosts are found in the .net domain, which is more common for network operators. In 2008, there were 95 million hosts with a .com domain name, up from only 8 million in 1998, and 190 million with .net domains, compared to just 5 million in 1998.⁹³ As computing power increases, a single device may act like several by having multiple IP addresses and domain names. Coupled with the fact that Internet host surveys often miss a sizeable portion of private hosts that reside behind firewalls, this means that host counts tend to under-represent the minimum size of the Internet.⁹⁴

Firms with Web sites

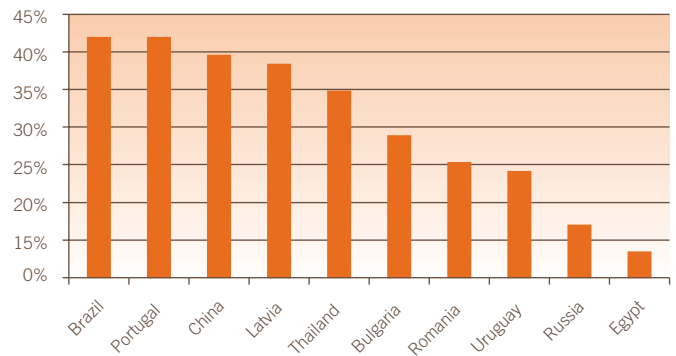
Having an Internet presence has become an essential part of modern business as the lines between shopping, browsing, working, and playing on the Web begin to blur for most consumers. In this sense, Web sites not only allow firms to get into the e-commerce game but also serve as a vital part of their advertising. In 2008, over 50 percent of shoppers said they first went online to research the products they wanted to buy. According to data from the United Nations Conference on Trade and Development (UNCTAD), in 2008, Switzerland, Sweden, and Japan led the world with 90, 89, and 84 percent of firms, respectively, having a Web site. (Figure 11 lists the top ten countries in which businesses operate a Web site as a percentage of all businesses in the country.) On the other end of the spectrum, in reverse order, Egypt, Russia, and Uruguay had the lowest levels with 18, 21, and 27 percent of firms online (see figure 12). Separately, research has shown that the Web sites of U.S. businesses tend to be the most global in scope, with those of European businesses next, and the Web sites of Asian-Pacific businesses lagging behind in this regard.⁹⁵

Figure 11: Top ten countries by percentage of businesses with a Web site, 2007



Source: UNCTAD, *Information Economy Report 2009*

Figure 12: Bottom ten countries studied by percentage of businesses with a Web site, 2007

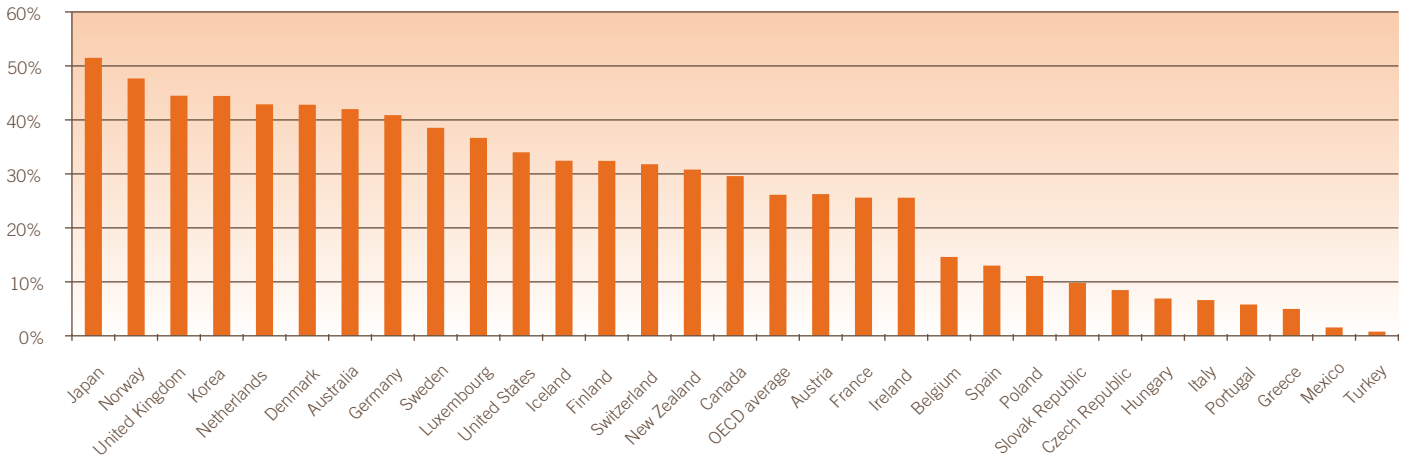


Source: UNCTAD, *Information Economy Report 2009*

B2C E-commerce

Given the emergence of e-commerce in the United States and the continued dominance of firms such as Amazon and eBay, it would be logical to expect that the United States leads the world in B2C e-commerce (e.g., online retail). However, using the measure of the percentage of the adult population purchasing goods or services over the Internet in the past 12 months, the United States in fact ranked eleventh among the 30 OECD nations at 34 percent in 2007. Japan leads the world with 52 percent of adults having purchased goods or services over the Internet in the past 12 months (although this figure includes everything from purchasing a \$3,000 TV to a \$2 ring tone for a cell phone). Following Japan are Norway, the United Kingdom, and Korea with 48, 45, and 44 percent respectively (see figure 13). The lead Japan, Norway, and Korea have in the use of B2C e-commerce comes as no surprise given that these countries have some of the world's most advanced broadband infrastructure, highest broadband penetration rates, and decidedly digitally literate populations. Although the United Kingdom has lower broadband rates than Japan, Norway, and Korea, consumers in the United Kingdom have embraced online shopping. In the United Kingdom, ten percent of non-financial sector sales were over the Internet in 2008⁹⁶ and the number of individuals banking online in the United Kingdom grew by over 500 percent, from 3.5 million to 21 million citizens, between 2000 and 2007.⁹⁷

Figure 13: Percentage of adult population purchasing goods or services over the Internet, 2007



Source: OECD, 2008⁹⁸

Online retail spending, per GDP, is highest in the United Kingdom, with B2C e-commerce in 2009 reaching 2.7 percent of GDP—more than double the amount in the United States. Part of this large difference may be due to differing definitions of retail between countries. Regardless, digital commerce in the United Kingdom has grown quickly between 2005 and 2009 and has become extremely popular. Despite having the highest percentage of citizens who purchase goods and services through dot-coms, B2C e-commerce as a percent of total retail sales is lower in Japan than in several other leading nations. In 2008, e-commerce in Japan reached \$67 billion, or 1.3 percent of GDP, less than that in the United Kingdom, Sweden, and Germany. Part of the reason for this is the types of products Japanese purchase online. While in the United Kingdom online consumers are likely to purchase more expensive items such as computers and high-end clothing, Japanese consumers are more likely to buy cheaper digital goods such as mobile applications, music, or ringtones for their cell phones.

The four nations leading the world in e-commerce are Denmark, Sweden, the United Kingdom, and the United States.

B2C e-commerce in Europe grew by 37 percent from 2006 to 2007 to reach \$197 billion, or 1.3 percent of European GDP, and is expected to reach \$407 billion by 2011.⁹⁹ B2C e-commerce exists to differing degrees across Europe. For example, although the United Kingdom, Germany, and France account for less than 60 percent of European Union GDP, they make up 72 percent of European B2C e-commerce (which accounts for 0.9 percent of EU GDP). In the United Kingdom, consumers spend

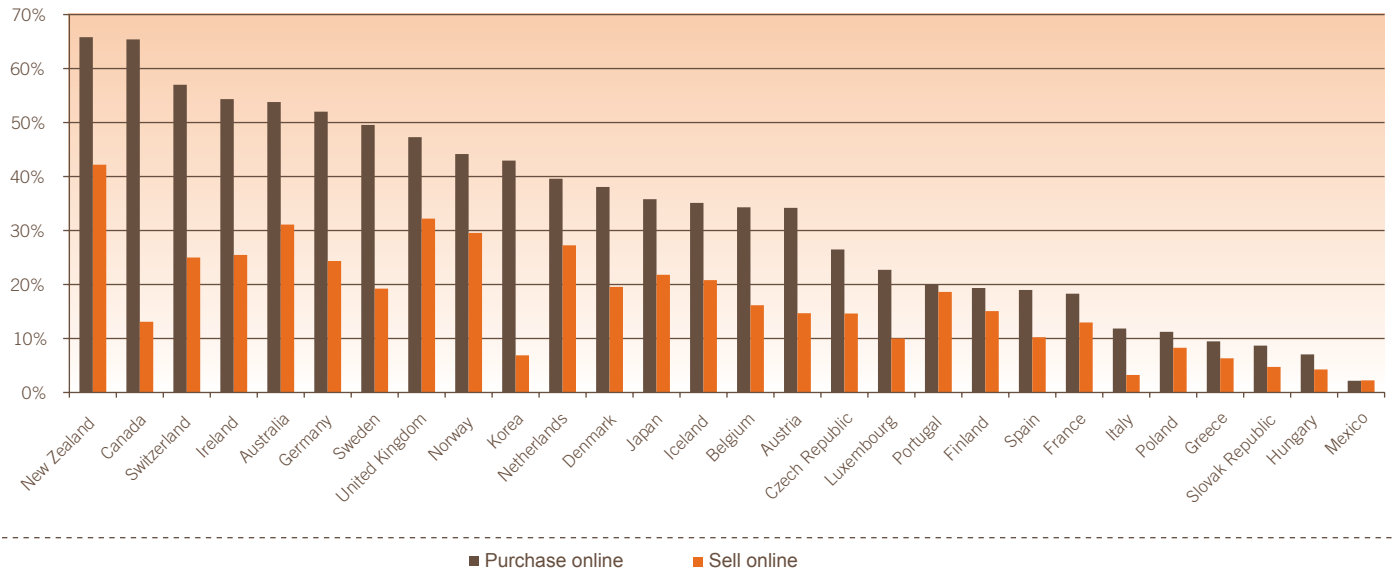
on average \$2,200 per year on e-commerce, compared to \$990 in Germany, \$850 in France, and \$1,100 in the United States.¹⁰⁰

Amongst OECD countries, Turkey, Mexico, and Greece have the lowest rates of B2C e-commerce activity, with 0.8, 1.6, and 5 percent of adults, respectively, purchasing goods over the Internet in 2007. These countries tend to have both lower levels of Internet access and citizens who both rely heavily on conventional consumer networks and who are traditionally cautious about purchasing goods and services without face-to-face contact.

B2B E-commerce

While the Internet economy is generally thought of as enterprises selling to consumers, the vast majority of e-commerce is actually comprised of businesses selling to other businesses. In 2007, roughly 90 percent of global e-commerce was B2B, slightly lower than the percentage in the United States. On average within OECD countries, 17 percent of businesses sell and 33 percent of businesses purchase over the Internet.¹⁰¹ New Zealand, Canada, and Switzerland lead in the number of businesses purchasing over the Internet, with 66, 65, and 57 percent of firms, respectively, purchasing online in 2008 (see figure 14). While in most countries the amount of B2B e-commerce varies significantly by sector, in Canada, of the sectors studied, only the transportation sector had less than 50 percent of businesses purchasing online, demonstrating Canada's strength in e-commerce across the board. Appendix B provides data for 27 OECD countries showing the percentage of businesses purchasing and selling over the Internet in 2006 by the following industry sectors: construction, manufacturing, real estate, transportation and storage, wholesale trade, and retail trade.

Figure 14: Percent of firms selling and purchasing online, 27 OECD countries, 2009

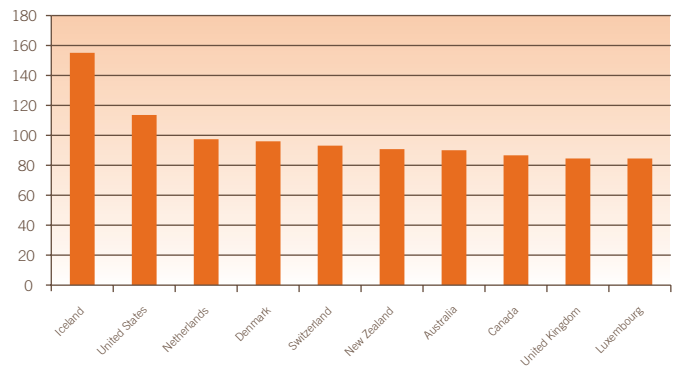


Source: OECD, 2009¹⁰²

Security of E-Commerce

Trust is essential for countries to realize a healthy dot-com economy. While consumers are accustomed to buying goods and services through face-to-face transactions, and businesses are accustomed to making payments through closed financial networks, moving commerce to the open platform of the Internet requires maintaining the highest levels of trust and security. As commerce has grown on the Internet, identity theft and online fraud have followed. Accordingly, Internet security has become an essential part of the digital economy. One critical security measure is to use secure socket layer (SSL) certificates to encrypt traffic between Web sites and consumers so that credit cards, passwords, and other sensitive data do not travel in plain text over the Internet. The United States has the largest number of servers using SSL certificates in the world, just under 350,000. The United States, United Kingdom, and Switzerland have the largest shares of servers using SSL certificates in the world. (See Appendix C for a table showing the number of secure servers using SSL certificates and percentage growth in secure server usage from 1998 to 2008 for all OECD nations.)¹⁰³ Figure 15 shows the top ten countries for servers using SSL certificates per 100,000 inhabitants in 2008. However, since 1998, Korea, Japan, the Netherlands, Denmark, and Poland have all seen increases of over 10,000 percent in the number of servers using SSL certificates. When taken as a percent of GDP, Iceland leads the world in number of servers using SSL certificates.

Figure 15: Secure servers per 100,000 inhabitants, 2008



Source: OECD, 2009¹⁰⁴

THE U.S. INTERNET ECONOMY

.com Domain Names in the United States

With just over 63 million active .com domain names in 2009, the United States far exceeds other nations in the number of .com addresses. The United States has experienced rapid growth in registered .com domain names over the past decade. Between 1999 and 2007, the number of registered .com domain names in the United States increased by 1,300 percent. In 1999, there were roughly the same number of firms in the United States as .com domain names, however by 2007 that figure had expanded to 9 .com domain names for every one enterprise.¹⁰⁵ While certainly some share of .com domain names are for personal blogs or other not-for-profit sites, the speed at which the number of .com domain names has grown clearly indicates they are a vital, if not the sole, storefront for many 21st century businesses.

In the United Kingdom, consumers spend on average \$2,200 per year on e-commerce, compared to \$990 in Germany, \$850 in France, and \$1,000 in the United States.

For small firms, having an Internet presence has today become as much a requirement of doing business as having office computing systems and productivity software was 20 years ago. In 1999, only ten percent of U.S. small businesses operated a Web site (compared to almost 60 percent of large firms). In 2008, roughly 50 percent of small businesses had a Web site and virtually all large firms did.¹⁰⁶ In most cases, the Web site at least allows potential customers to get basic information about the business (its location, hours, personnel, etc.). Moreover, while many small businesses may not have their own Web site, they still maintain an online presence through another Web site, such as a listing of local restaurants or a social networking site.

The geographic distribution of the dot-com economy across the United States is quite varied. Forty-four percent of .com domain names in the United States are registered to addresses in just five states, California, New York, Florida, Texas, and Illinois, which collectively are home to less than one-third of the U.S. population.¹⁰⁷ However, Nevada, Virginia, Arizona, Utah, and Washington lead the nation in the number of .com domain names as a share of total enterprises (see table 6). The number of domain names per firm varies significantly by state across the country. Nevada has 6.5 times as many domain names per firm as does the lowest ranking state, South Dakota. (The former's particularly high score is likely attributable to the large number of gambling and adult industry sites located there, as firms in these industries may register a disproportionate number of domain names.) Nevertheless, as one would expect, states with a strong presence of high-tech companies tend to rank near the top in terms of domain name per firm, and in fact, Virginia, Utah, Washington, and California claim four of the top six spots.

Also, as expected, there is a reasonably strong correlation (.53) between states with a high number of domain names per firm and states with more extensive broadband deployment.¹⁰⁸ Yet between 2004 and 2007 the median number of domain names in states nearly doubled from 242,000 to 400,334, suggesting that all states are playing a robust role in the dot-com economy. (See Appendix D for the total number of domain names, and number of domain names per firm, in each U.S. state.) Table 7 shows the states with the greatest growth in domain names per firm between 2002 and 2008.

Table 6: Top five states by domain names per firm

The Top Five	Domain names per firm
1 Nevada	12.3
2 Virginia	11.1
3 Arizona	8.8
4 Utah	8.5
5 Washington	7.4
U.S. Average	5.1

Source: 2008 State New Economy Index¹⁰⁹

Table 7: Top seven state movers by domain names per firm

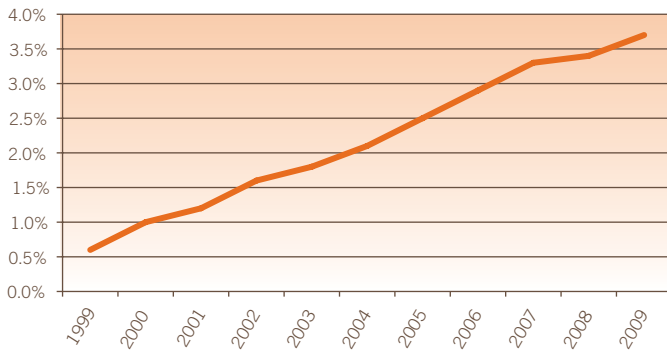
The Top Seven Movers	2002 Rank	2008 Rank	Change 2002-2008
1 Tennessee	30	19	11
2 Texas	20	10	10
3 Washington	15	5	10
4 Vermont	25	16	9
5 South Carolina	39	32	7
5 Utah	11	4	7
5 Oregon	19	12	7

Source: 2008 State New Economy Index¹¹⁰

E-commerce in the United States

Despite popular belief around the time of the dot-com bubble's bust, there was in fact no bubble for B2C e-commerce (that is, online retail sales) in the United States. Seasonally adjusted online retail sales as a share of total retail sales have actually climbed every quarter since 1999 (see figure 16).¹¹¹ In fact, online retail sales have increased as a share of total retail sales on average by 5 percent each quarter since 1999. Moreover, between 2002 and 2007, U.S. retail sales through e-commerce increased by 23.1 percent annually in comparison to just 5 percent for total retail sales. Total U.S. B2C e-commerce reached \$127 billion in 2007 and \$135 billion in 2009.¹¹²

Figure 16: E-commerce as a percentage of total U.S. retail sales, 1999-2009

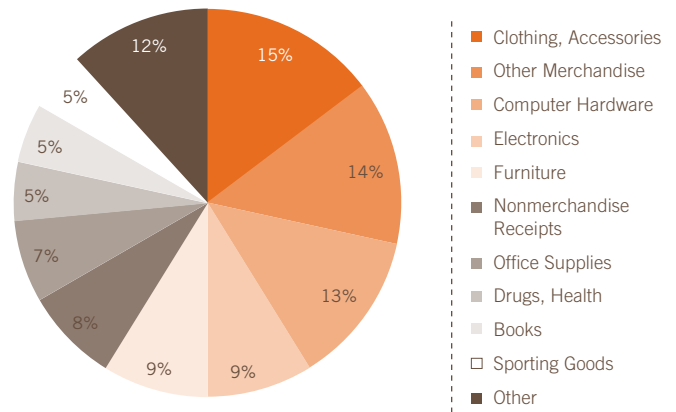


Source: U.S. Census Bureau, Annual Retail Trade Survey, 2009¹³

And despite pessimistic e-commerce forecasts based on the recent economic climate, online retail continued to grow as a percentage of total retail sales between the first quarter of 2008 and the fourth quarter of 2009, reaching \$39 billion in the fourth quarter of 2009. Moreover, even as total retail sales fell by 9 percent during the recession, e-commerce sales grew by 5.5 percent, or \$1.9 billion (although lower than the 18.4 percent growth rate seen between 2006 and 2007). This is not to say that online retail sales have been unaffected by the recession. In Q1 and Q2 2009, the unadjusted absolute value of online retail sales dipped below Q1 and Q2 2008 levels before rebounding in Q3 2009. The 2009 holiday season, however, proved to be an unexpected boon for online retailers, as online holiday spending increased by 4 percent over 2008.¹⁴ In fact, despite the poor overall economy, December 2009 produced the largest monthly online retail sales volume in the history of U.S. e-commerce.

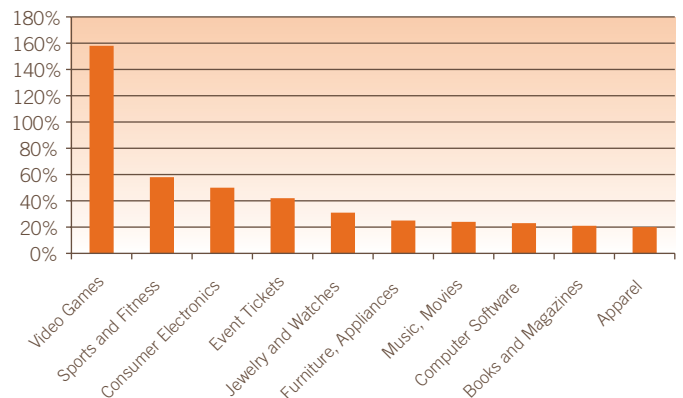
With regard to U.S. B2C e-commerce, online retail sales of clothing, footwear, and accessories comprise the largest share, followed by other merchandise, computer hardware, and electronics and appliances, making up 15, 14, 13 and 9 percent, respectively (see figure 17). However, the fastest growing category for online retail is video game consoles and accessories, which grew by 159 percent between 2006 and 2007, followed by sports and fitness, consumer electronics, and event tickets with 58, 51, and 44 percent growth, respectively (see figure 18).

Figure 17: Percentage of e-commerce sales in U.S. by industry category, 2007



Source: U.S. Census Bureau, 2009¹⁵

Figure 18: Fastest growing e-commerce categories in U.S., 2007



Source: Digital Factbook, 2008¹⁶

As Americans go online in ever greater numbers, especially via increasingly higher-speed broadband networks, and as they continue to gain comfort and familiarity with buying online, online retail sales will likely continue to grow at a more rapid rate than overall retail sales for the foreseeable future.¹⁷ This

growth is aided as online retailers increasingly offer free shipping and frequently do a better job of marketing (including sales offers emailed directly to consumers) than offline businesses.¹¹⁸ Moreover, online retailers continue to develop techniques to improve their Web sites by including, for example, more detailed product descriptions, images, and user reviews. As a result, according to the American Customer Satisfaction Index, consumers are more satisfied with online retail than offline retail. In a 2006 survey, online retailers scored an average of 9 percent higher than general retailers, up from 5 percent higher than in 2000.¹¹⁹

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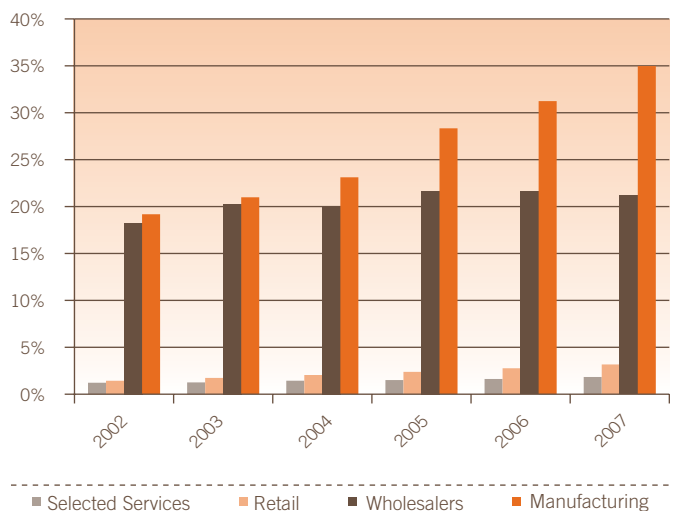
Notwithstanding this growth, online retail sales still account for a modest share of overall retail sales, just over 3.5 percent of total revenue in 2009. Considering that three-quarters of adult Americans use the Internet, over 80 percent of whom have broadband access at home, online retail sales seem low.¹²⁰ Some products are still hard to buy over the Internet (such as furniture or large appliances, where shipping costs are usually very high and customers often wish to visually inspect the item before purchase). Other products and services are hard to buy over the Internet due to state regulations or resistance from wholesale or retail middlemen. For example, many states impose restrictions on wine and beer purchases over the Internet, and all 50 U.S. states prohibit the sale of vehicles over the Internet direct from automobile manufacturers. And yet while the percentage of Americans using B2C e-commerce falls below countries such as Korea, Japan, Norway, and the United Kingdom, U.S. spending on Internet purchases is still nearly 2.5 times the OECD average.

Manufacturing and Wholesale Trade: Despite the rapid growth of online retail sales, e-commerce is actually much more prominent in other major sectors of the economy, especially in manufacturing and merchant wholesale trade. This is because B2B e-commerce is actually much larger than B2C e-commerce activity, both in the United States and around the world. Indeed, B2B e-commerce within the manufacturing sector has played a major role in bringing down expenditures by reducing transaction costs, creating more flexible supply chains, and enabling manufacturers to rely less on inventory. In 2007, combined B2C and B2B e-commerce within the manufacturing sector reached \$1.8 billion, or 35 percent of total trade, up from 18 percent in 2002 (see figure 19).¹²¹ (See Appendix E for underlying data showing the dollar and percentage amounts that B2B e-commerce accounted for in terms of the total amount of commercial trade in the manufacturing, wholesale trade, retail trade, and selected services sectors from 2002 to 2007.)

B2B e-commerce is pervasive within the manufacturing sector, accounting for at least 17 percent of total shipments in 21 manufacturing industries studied by the U.S. Census.¹²² Within the U.S. manufacturing sector, the beverage and tobacco, transportation equipment, and textile industries account for the largest shares of B2B e-commerce as a percent of total trade, at 56, 56, and 47 percent, respectively. (See Appendix F for a table showing the dollar value and percentage of sales that B2B e-commerce activity accounts for across 21 manufacturing industries in the United States.)

Services: Despite only making up 2 percent of total services revenue, online services have grown steadily. They are particularly important in services that are information-rich in nature and do not require person-to-person interaction. While people increasingly use the Internet to schedule a haircut, for example, getting your haircut still requires physical proximity to the barber. Two informational services that have a fairly large online market share are travel and banking. Online reservations account for one-quarter of the reservation and travel industry's revenue.¹²³ In total, 63.1 million U.S. households (about 57 percent) used Internet banking as of August 2008.¹²⁴ However, online banking in the United States varies considerably by income level. Currently 69 percent of higher-income Americans (those earning more than \$100,000 a year) use online banking, but only 19 percent of American households earning under \$50,000 do so. Many believe that mobile devices present an opportunity to expand the reach of online banking. The number of mobile banking customers in the United States is anticipated to increase by 2,000 percent between 2006 and the end of 2010, and given the relative price of mobile devices to PCs it is reasonable to assume a greater number of these new customers will be from lower-income consumers.¹²⁵

Figure 19: E-commerce as a percent of total trade value, in U.S., 2002-2007



Source: U.S. Census Bureau, 2009¹²⁶

THE EUROPEAN INTERNET ECONOMY

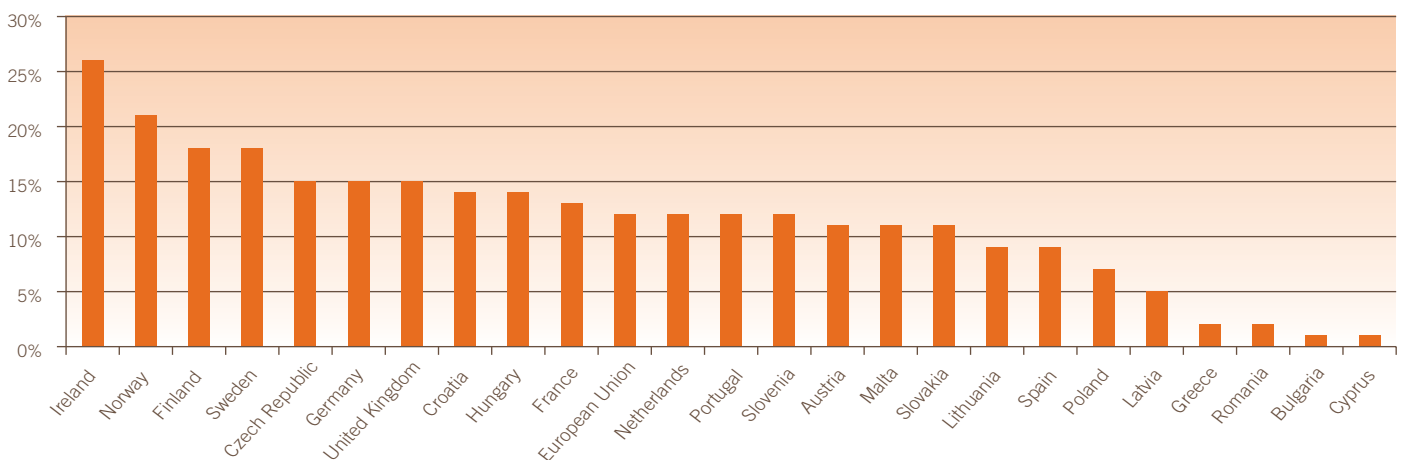
Although behind the United States, the Internet economy throughout Europe is highly developed, particularly in Northern and Western Europe. Over one-third of Europeans purchased goods or services online in 2009, a percentage that is estimated to grow to over half by 2013. Yet there is significant diversity within EU27 nations.¹²⁷ In Norway, the United Kingdom, Denmark, Sweden, and the Netherlands, over 60 percent of the adult population purchased goods or services over the Internet in 2009, compared to less than 10 percent in many small Eastern European nations. Although much of this discrepancy can be attributed to poor digital infrastructure, cultural factors such as trust levels in e-commerce and attitudes towards distance shopping hinder the dot-com economy in some countries.¹²⁸ Overall, the percentage of dot-com shoppers grew by 85 percent in Europe between 2004 and 2009. Although emerging markets in Eastern Europe saw the largest percentage growth, even countries with established Internet markets, such as Germany, Denmark, Finland, Norway, and the United Kingdom grew by over 50 percent.

As figure 20 shows, Ireland along with several Nordic nations lead Europe in percent of enterprise sales and procurement through e-commerce (both B2B and B2C), with Eastern and Southern Europe lagging. The discrepancies within Europe in the dot-com economy are not surprising given Northern Europe's clear lead in digital infrastructure, from some of the highest broadband speeds and penetration rates in the world to a highly digitally-literate population. Southern and Eastern European nations on the whole have seen slower economic growth and slower deployment of digital infrastructure, and in turn have traditionally had lower levels of digital transactions. However, some Eastern European countries such as Estonia have made significant investments in digital infrastructure and education and consequently have been able to take advantage

of the dot-com economy. For example, as early as 2004, East Uhispank, Estonia's second largest bank, reported that more than half its customers bank online.¹²⁹ Ireland's impressive leadership in e-commerce is mostly attributable to high levels of B2B transactions in its industrial and manufacturing sectors. Of the 27 countries assessed in one study, Ireland's manufacturing sector came in second in the world behind only New Zealand in the percentage of firms that sold or procured online, with 24 percent of firms selling and 54 percent of firms purchasing through e-commerce.¹³⁰

In terms of progress, the fastest growing European nation since 2003 in the growth of e-commerce as a share of total sales is Portugal, which experienced 650 percent growth. Part of Portugal's fast percentage growth rate reflects its low initial starting point. But some of the country's progress appears linked directly to policy. In the last half decade, Portugal has gone to great lengths to digitize its economy and often gets credit for being one of the countries that has seen the most progress in deploying digital infrastructure. In 2009, Portugal was ranked as the number one country in the world in terms of ease of starting a new business thanks to Portugal's new e-government business registration portal, Simplex. The Simplex system has completely digitized the process of registering new businesses in Portugal (the "paperwork" can be completed in just 20 minutes online), and doing so may have created the incentive structure needed to convince businesses in Portugal to begin taking advantage of B2B e-commerce. Spain and Norway also saw rapid improvements, of about 330 and 240 percent, respectively, in percent of enterprise sales through e-commerce (see table 8). Norway's growth is particularly impressive; it was already a leader in 2003, and by 2009 placed second (out of those countries for which data are available) behind Ireland in percent of enterprise sales through e-commerce.

Figure 20: Percent of enterprise sales through e-commerce, select EU countries, 2009



Source: Eurostat, 2009¹³¹

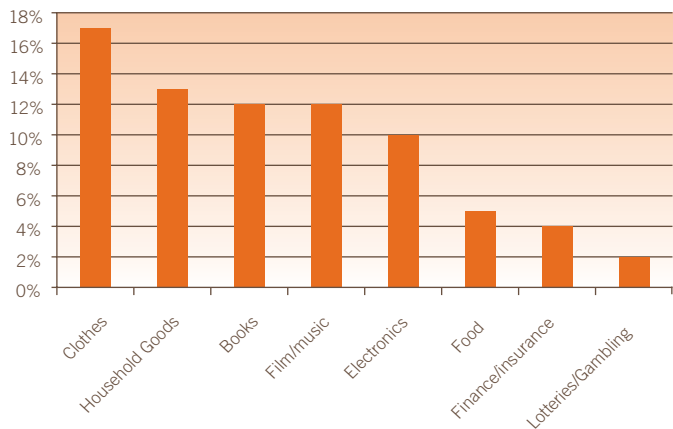
Table 8: E-commerce as a share of total sales, selected European countries

Country	E-commerce as a share of total turnover, 2003	E-commerce as a share of total turnover, 2004	E-commerce as a share of total turnover, 2005	E-commerce as a share of total turnover, 2006	E-commerce as a share of total turnover, 2009	Percent Change in e-commerce 2003-2009
Portugal	1.6	4.9	N/A	8.2	12	+650%
Spain	2.1	2.9	2.7	6.9	9	+329%
Norway	6.2	7.5	14.7	13.9	21	+239%
Czech Republic	5.7	5.9	8.4	7.1	15	+163%
Poland	N/A	2.8	4.4	5.9	7	+150%
Denmark	7.5	12.2	N/A	17.5	N/A	+133%
Greece	0.9	1.6	2.1	2.8	2	+122%
Austria	6.3	6.8	7	9.9	11	+75%
Finland	10.6	12.7	14.2	14.3	18	+70%
Ireland	16.6	18.3	20.2	16.7	26	+57%
Sweden	12.3	N/A	N/A	13.6	18	+46%
Germany	N/A	11.3	13	13.9	15	+33%
United Kingdom	11.9	14.3	15.6	17.4	15	+26%
Belgium	7	6.5	8.8	7.9	N/A	+13%
Iceland	5.9	N/A	N/A	8	N/A	+36%
Italy	1.9	3.4	2.1	2	N/A	+5%

Source: E-Stats, 2009¹³²

The distribution of online retail sales throughout the European Union appears similar to that of the United States, although because Eurostat and the U.S. Department of Commerce break down retail sales into slightly different categories, an exact comparison is not possible. That being said, clothes and accessories account for the largest percentage of sales in both the United States and Europe, followed by film and music in the EU (see figure 21). (Within the United States, film and music fall into the “other merchandise” category which is also second.) EU consumers purchase more books online, whereas in the United States consumers spend a greater share on electronic products.

Figure 21: Percent of sales through e-commerce in the EU by product category, 2009

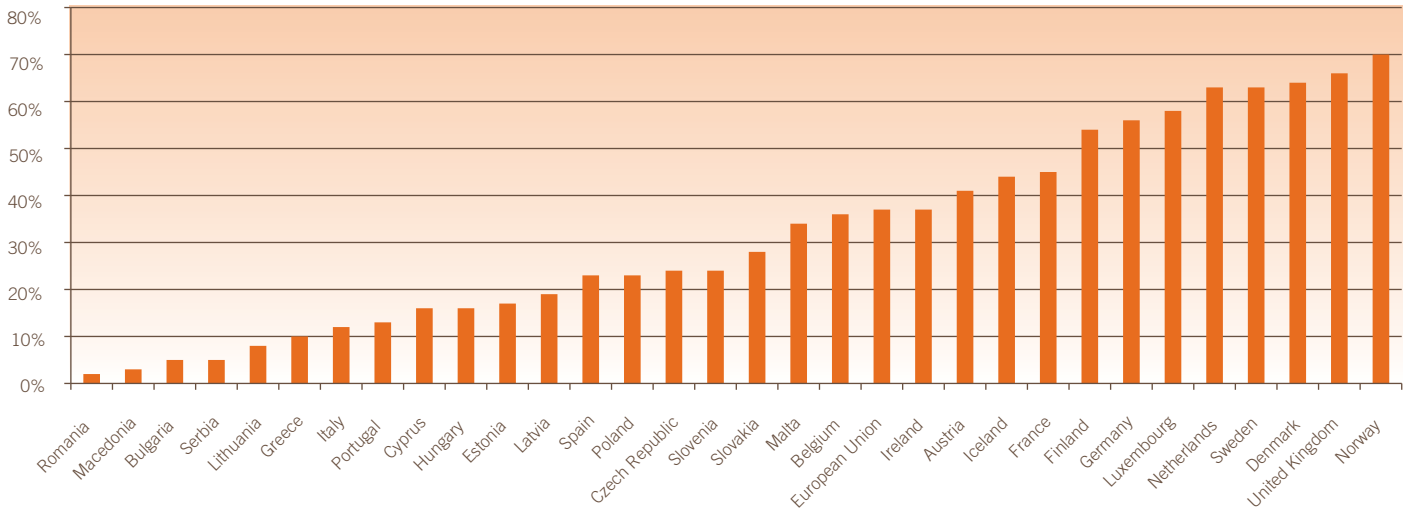


Source: EuroStat 2009¹³³

Figure 22 shows the percentage of European citizens, by country, who purchased goods or services over the Internet in the last 12 months, while figure 23 shows the growth in percentage of

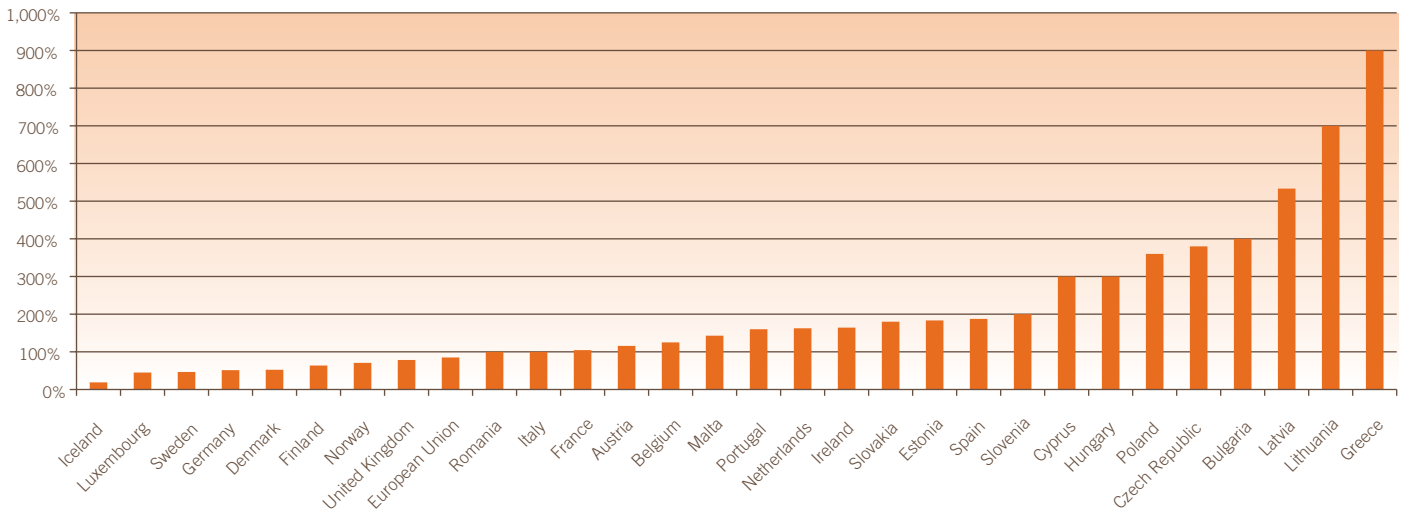
European citizens, by country, who purchased goods or services over the Internet in the past 12 months.

Figure 22: Percentage of European citizens who purchased goods or services over the Internet in the last 12 months, 2009



Source: EuroStat 2009

Figure 23: Percent growth of Europeans purchasing over the Internet within the last 12 months, 2003-2009

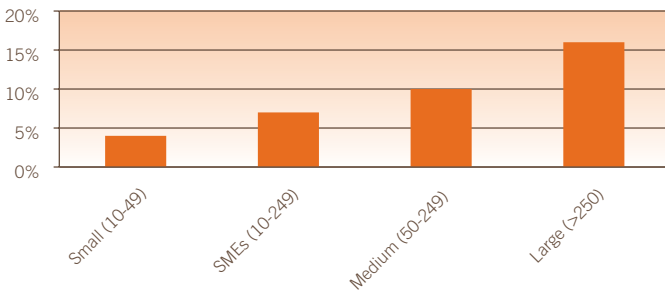


Source: EuroStat 2009

Dot-coms in Small Businesses

As in most regions, e-commerce adoption by smaller enterprises in Europe has been slower than by larger firms. In 2008, e-commerce sales as a percentage of total sales were four times as high in large firms (firms with greater than 250 employees) and 2.4 times higher in small-medium enterprises (SMEs; firms with 10 to 250 employees) than in small firms (those with 10 to 49 employees) as figure 24 shows. Not surprisingly, EU countries with SMEs disproportionately using e-commerce are leaders in overall B2C and B2B e-commerce. Ireland and Norway lead the EU with 24 and 13 percent, respectively, of sales amongst small firms coming from e-commerce, compared with the EU average of 6 percent. Surprisingly, three of the seven countries with higher-than-average sales from e-commerce for small businesses are in Eastern Europe, with Croatia (11 percent), Lithuania (8 percent), and the Czech Republic (8 percent) being among Europe's leaders. (See Appendix G for a full list of e-commerce in EU countries by firm size.)

Figure 24: Percent of e-commerce sales by firm size, EU27, 2009



Source: EuroStat 2009

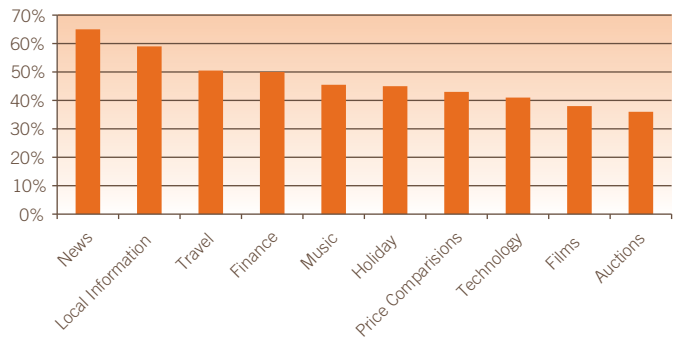
Dot-coms in Europe Beyond E-commerce

E-commerce figures neglect how online information gathering impacts consumption in Europe, as many shoppers research products online and then buy them offline. In fact, of the Internet users in Europe who have used the Internet to research products, a greater percentage purchased these products offline than online. Forty percent of European consumers regularly use the Internet to research products before buying and 59 percent cite the Web sites of popular brands as an important source of information. Indeed, between 2006 and 2007, the percentage of Europeans who sought out reviews or ratings before buying online increased by 42 percent. In Sweden, the number of consumers who contributed to ratings or reviews increased an astounding 383 percent over that timeframe. Yet online product information influences European consumers to differing degrees; online shoppers in the United Kingdom are the most likely to make a decision based on online information (50 percent) whereas Italians are the least likely to let online information affect their purchase decision (27 percent).¹³⁴

While information gathering accounts for a large portion of Europeans' use of the Internet, an increasing number of Europeans use the Internet as a form of entertainment and

as a way of staying connected with friends, family, and even strangers with shared interests. Between 2006 and 2007, the fastest growing use of Web sites in Europe was to watch videos (up 150 percent), view ratings (up 42 percent), download film or TV shows (up 18 percent), listen to podcasts (up 17 percent), and share data through P2P networks (up 15 percent). And 42 percent of European Internet users regularly communicate through social networking sites.¹³⁵ Figure 25 shows the top ten categories of Web sites by percent of use in the EU10, with news, information, and travel sites accounting for the top three.

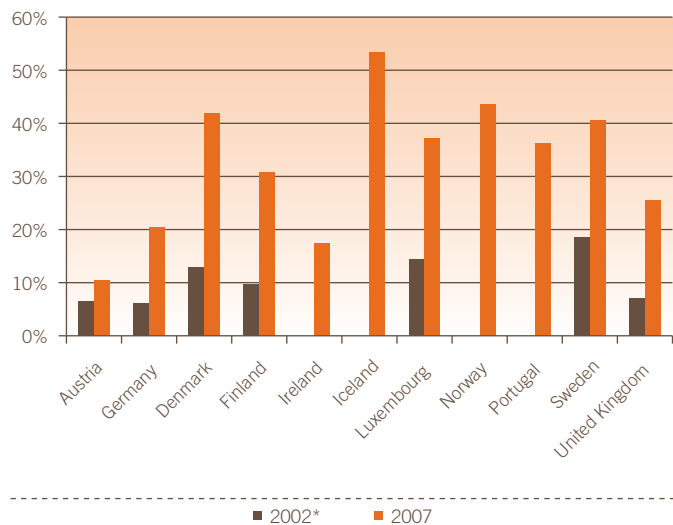
Figure 25: Top ten categories of Web sites, by percent of use in the EU10, 2008



Source: ELIAA, 2009¹³⁶

As more Europeans gain access to high-speed broadband, the Internet is rapidly taking the place of TVs and radios across the continent. In 2007, 32 percent of European Internet users (of the countries studied) watched TV online or listened to Internet radio, up from 9 percent in 2002. In Iceland, over 50 percent of citizens use Internet TV or radio (see figure 26).

Figure 26: Percent of Internet users in Europe using Internet-based TV or radio



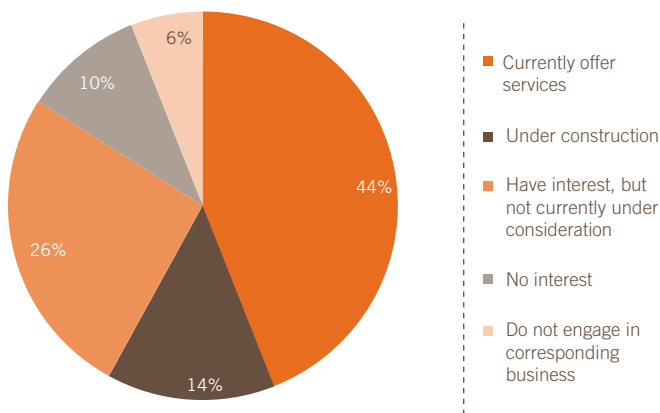
Source: OECD Information Technology Outlook, 2009.
* 2002 data not available for all countries.

THE ASIAN INTERNET ECONOMY

As with Europe, despite large discrepancies across countries, the Internet economy is growing in Asia. Total B2C sales in Japan, Korea, China, and India were worth \$51 billion in 2006, and are expected to reach \$115 billion in 2010. Japan boasts the highest percentage of citizens using the Internet to buy goods and services (52 percent) in Asia (and the world) followed by Korea (45 percent), both significantly higher than the OECD average of 26 percent. As expected, other Asian nations, especially China, have much lower percentages of their populations involved in the Internet economy. Yet these figures are changing rapidly. It is anticipated that China will see large growth in B2C e-commerce in both absolute and percentage terms, growing from total online retail sales of \$2.5 billion in 2006 to \$18 billion in 2010, or 64 percent annual growth (compared to anticipated 17 percent growth over the same time period in Japan).¹³⁷

Japan: Japan has a particularly strong mobile commerce market, including an \$8.4 billion market for contactless mobile payments in 2008.¹³⁸ Although many of these payments come in the form of kiosk transactions through mobile phones, the portion of Japanese using mobile devices for traditional dot-com commerce is much larger than in the United States or Europe. Of enterprises selling to customers online, 44 percent have platforms for mobile devices, and another 14 percent of firms are in the process of developing mobile platforms (see figure 27).¹³⁹ B2B e-commerce in Japan also comprises a larger percentage than in many other countries. In 2008, B2B e-commerce was worth \$1.8 trillion, or 13.5 percent, of total sales, up from 12.6 percent in 2006.¹⁴⁰

Figure 27: Percent of e-commerce sites in Japan, by readiness for mobile devices, 2008



Source: Ministry of Economy, Trade and Industry ¹⁴¹

Korea: Although a leader in international broadband rankings, many firms in Korea have been slow to adopt e-commerce. However, this is changing. In 2006, roughly one-third of firms in Korea conducted e-commerce, up from 18 percent in 2004. Across firm sizes, as expected, a greater percentage of large firms (here defined as over 1,000 employees) participate in the dot-com economy than small firms (10-49 employees), 64 percent versus

30 percent. Yet having 30 percent of small firms selling over the Internet is particularly high for a middle-income economy such as Korea. Many consumers in Korea caught onto the dot-com economy early. By 2004, Korea was the first country in the world to sell more songs online than in stores. Indeed, between 2000 and 2006, Korea went from having 8,000 physical music stores to just 400, with the vast majority of music now being purchased online.¹⁴²

China: Whereas Japan and Korea have the most mature dot-com economies in Asia, China is experiencing rapid growth in e-commerce. According to Analysys International, a Chinese-based e-marketing firm, total e-trade increased by over 100 percent in 2008.¹⁴³ With such explosive growth and the second largest Internet-using population in the world, 210 million (behind only the United States), many analysts believe that in time China will become one of the world's largest dot-com economies. However, regardless of its size, China has many hurdles to overcome to become a leader in the global Internet economy.

Despite having only 8 million fewer Internet users than the United States, Internet retail sales were just \$2.5 billion in 2006, compared to \$125 billion in the United States.¹⁴⁴ Thus, e-commerce represented only 0.06 percent of total GDP, 15 times less than the ratio of B2C e-commerce to GDP in the United States.¹⁴⁵ China thus clearly has a long way to go to equal the most advanced nations in per capita Internet use and e-commerce value. And in order to make progress in the dot-com economy, China will have to overcome numerous structural, cultural, and legal hurdles. In terms of the latter, China has tremendous identity theft and digital piracy problems, which create significant roadblocks to e-commerce. For example, China has the highest rate of illegally downloaded songs in the world, with 90 percent of downloaded songs stolen.¹⁴⁶ Why establish legitimate content sites when the market will be minimal because the government turns a blind eye to digital piracy? Furthermore, Chinese consumers' uncertainty with digital transactions has created substantial privacy concerns over e-commerce. As figure 28 shows, amongst Asian nations surveyed, the OECD found privacy concerns over online retail to be much higher in China than other Asian nations. Over half of Chinese do not shop online because of concerns over privacy, compared with just 20 percent of Japanese and 30 percent of EU27 counterparts.¹⁴⁷

China also has a considerable way to go to create the right economic foundation for the dot-com economy, on both the demand and supply side. A lack of online payment methods amongst consumers in China limits their ability to use online retailers. For example, in 2007, there were over 1.5 billion credit cards in circulation in the United States, compared with just 50 million in China. Furthermore, Chinese SMEs have virtually no presence on the Internet, with just 100,000 SMEs out of 40 million selling products online. Few doubt that China is increasingly becoming a major global economic player, but without addressing these deep-seated structural, cultural, and legal issues, the dot-com economy will remain a peripheral component of China's economy.

THE INTERNET ECONOMY IN THE DEVELOPING WORLD

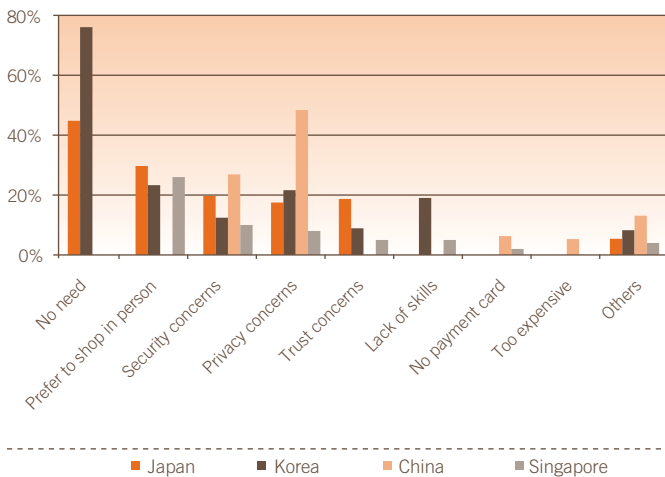
Although far behind OECD countries, some developing nations are making considerable inroads into the Internet economy. Between 2000 and 2008, the number of country code domain names belonging to non-OECD countries doubled from 20 percent of the global total to just under 40 percent. Over that timeframe, the number of country code domain names in non-OECD countries grew by 39 percent annually, compared to 25 percent in OECD countries.¹⁵³ And because many small countries predominately use .com addresses instead of specific country code Top Level Domains (ccTLDs), it is likely that the percentage of Web sites originating in developing nations is larger still.

The proliferation of devices and networks through which to tap into the Internet economy has played a crucial role in bringing the developing world online. In 1998, two-thirds of the world's ICT imports went to the developed world and only one-third went to developing nations. By 2007, over 45 percent of ICT imports went to developing nations with just over 50 percent going to developed countries. While it's worth noting that within the developing world Asia accounts for the vast majority of progress in technology adoption, Africa's ICT market has remained stagnant and Latin American's ICT imports have actually declined during the last decade.¹⁵⁴ However, the decline in ICT imports in several developing nations has had little to do with a lack of demand and more to do with protectionist trade policies that restrict importation of foreign-made technology.

Governments often promulgate such policies in a usually vain attempt to spur local ICT production. But given the combination of often embryonic domestic technology industries and rapidly expanding market demand in these countries, the outcome frequently is higher prices for ICT products and lost opportunities for citizens and businesses. In other words, these countries are placing too much emphasis on information technology production and not enough on how the use of IT by businesses and consumers can more extensively (and rapidly) drive economic growth in their countries.

While in countries such as Switzerland, Sweden, and Japan over 80 percent of firms have Web sites, in many developing countries less than 50 percent of firms do so, and the majority of firms in these countries that do have a Web presence are large businesses. It is a rarity for micro, small, or medium-sized enterprises in developing countries to have a Web site, let alone to sell products or services online. Furthermore, these figures neglect the informal sector of the economy, which accounts for over three-quarters of non-agriculture employment in Africa and over 50 percent in Latin America.¹⁵⁵ Figure 29 shows the percent of businesses receiving or placing orders online for several developing nations. Figure 30 shows the percent of businesses with Web sites across a selected group of non-OECD countries.

Figure 28: Reasons for Internet users not buying online, select Asian countries, 2007



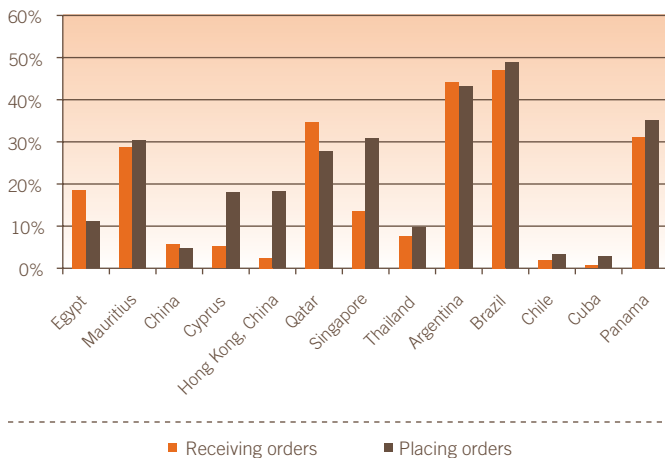
Source: OECD, 2009¹⁴⁸

Social Networking in Asia

Social networking sites are a huge part of the Internet culture in Asia. Behind search engines, the most popular sites in Japan, China, Korea, and Singapore are fc2.com, qq.com, and facebook.com (for both Korea and Singapore)—all social networking sites.¹⁴⁹ Indeed, in Singapore, Friendster, the most popular social networking site, receives 940,000 unique visitors per month, just shy of 20 percent of the country's population. And Japan has the highest rate of blog readership in the world. While Internet users in Europe and the United States spend more time downloading music and videos and watching video clips online, in Asia the Internet is more often used as a way to communicate. Americans spend nearly three times as much time playing video games online as the Japanese, whereas citizens in Japan and Korea spend roughly five times as much of their time online on social networking sites than Americans. One reason for this is that social networking Web sites in Asia serve multiple purposes from blogging to personal communication. This is probably one of the reasons why Americans spend more time on e-mail Web sites than citizens in Japan, Korea, or Singapore.¹⁵⁰

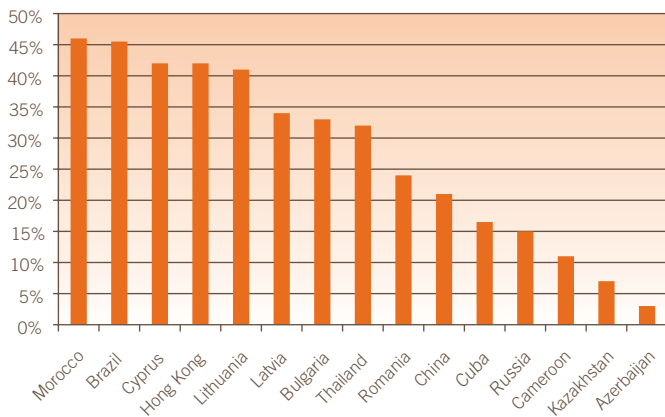
In Japan and Korea, ubiquitous high-speed broadband networks along with the most robust mobile communication infrastructures in the world have made uploading high-quality content via mobile devices extremely popular. However, in developing Asian nations such as China and Thailand, where first generation cell phones still dominate the market, fewer than 15 percent of mobile subscribers use their devices to go online.¹⁵¹ Yet social media is being adopted in unlikely places throughout developing Asia. For example, 11 million of the 13.5 million Internet users in Malaysia blog or use social media.¹⁵² One reason for this might be that in countries like Malaysia where the government has tight controls over traditional media, citizens leverage the anonymity of the Internet to express themselves.

Figure 29: Percent of businesses receiving or placing orders online, select non-OECD countries, 2008



Source: UNCTAD¹⁵⁶

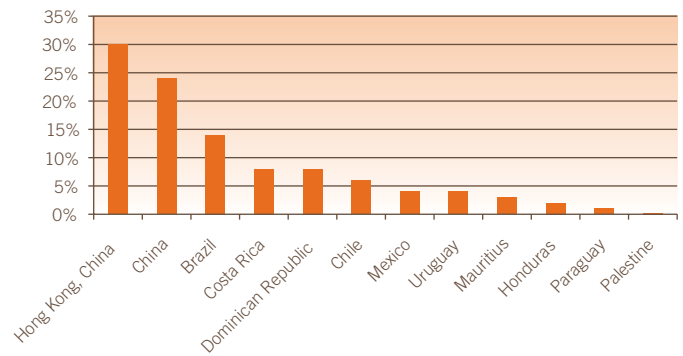
Figure 30: Percent of businesses with Web sites, select non-OECD countries, 2007



Source: OECD and Eurostat, 2008.

Yet despite its potential, actual sales via e-commerce remain low throughout the developing world. While data for all developing nations are not available, recent surveys of online shoppers in several developing countries indicate that the Internet economy in the developing world has a long way to go to reach that of the world leaders. Even in digitally advanced developing regions such as Hong Kong, only one in three Internet users has purchased goods or services over the Internet (and obviously, amongst the general population the percentage is much lower). And in many developing Latin American countries such as Uruguay, Honduras, and Paraguay, e-commerce is virtually non-existent. Furthermore, the data itself is likely to contain an information bias; countries with more pronounced digital markets are far more likely to have information on such markets than those with less developed e-markets. Therefore, it is safe to assume that e-commerce activity in most African nations, for example, is far below that of those countries represented in figure 31.

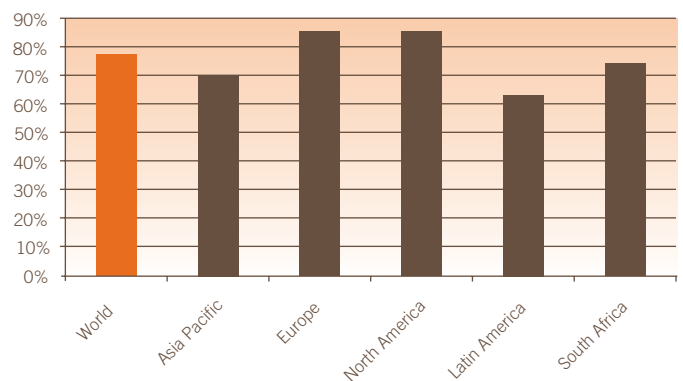
Figure 31: Percent of online population that has purchased online, select developing countries, 2007



Source: UNCTAD, 2007¹⁵⁷

Cultural factors, such as fear of non-personal commerce or strongly community-oriented markets, are often said to explain the lack of e-commerce in much of the developing world. To be sure, culture always plays a role in the adoption of new technologies. However, it is important not to overstate cultural issues as a barrier to new methods of commerce, especially when doing so might suggest that individuals would be unlikely to use the Internet even if they had Internet access. Indeed, lack of Internet access seems to play a much larger role in explaining the limited amount of e-commerce in developing countries than cultural or other factors. For example, amongst those in the developing world with access to the Internet economy, a similar percentage of consumers purchase goods and services online compared with their counterparts in the developed world. As figure 32 shows, 85 percent of European Internet users have made an online purchase, as compared to 63 percent of Internet users in Latin America and 74 percent in South Africa, showing that individuals across these disparate regions are likely to engage in e-commerce activity, if they enjoy Internet access.¹⁵⁸ Contrary to popular belief, when the Internet economy is accessible, people everywhere seem to be interested in taking advantage of it.

Figure 32: Percent of Internet users that have purchased products or services online, 2008



Source: AC Nielsen Poll¹⁵⁹

Just as the Internet helps consumers in the developed world research products and share where to find the best deals, the Internet has helped businesses in the developing world communicate beyond their traditional geographic networks. For example, a survey of e-commerce in Kenya's horticulture industry by the London School of Economics found that while few firms actually sold products online, the ability to exchange information with European buyers vastly increased the ease of exchange. Indeed, as one respondent noted, Kenyan firms had to drive their European counterparts to use the Web more often, "We had to push them, because telecommunications are so good in Europe, they were used to just calling someone; for us e-mail was a blessing."¹⁶⁰

Eighty-five percent of European and North American Internet users have made online purchases, compared to 63 percent of Internet users in Latin America and 74 percent in South Africa, showing that citizens across all regions are likely to engage in e-commerce, if they enjoy Internet access.

The Internet economy will likely continue to grow in many developing nations as the cost of mobile and other Internet-accessible devices continues to decline and individuals gain higher incomes and are able to more easily afford Internet service. For example, between 2000 and 2004, within the developing world the cost of making a cell phone call declined by two-thirds and the number of Internet users tripled.¹⁶¹ Going forward, both governments and the private sector will need to find the resources and resolve to scale up the Internet economy so the entire developing world can participate.

Just after the turn of the century, the staying power of the Internet economy was openly questioned. Yet the extraordinary expansion of the Internet to almost every corner of the world has disproven such criticism. While originally the product of the United States and initially used amongst a few technologically advanced, high-income countries, today the Internet economy is a stable medium for economic exchange across low-, medium-, and high-income countries alike. In many ways, a country's success in the Internet economy has become the modern hallmark of economic prosperity. In advanced and developing nations alike, dot-coms are fueling economic activity and promoting new means of social engagement in ways unimaginable only a few short years ago.

UNDERSTANDING DOT-COM BUSINESS MODELS



Custom Web-ordered Mini Cooper

One way in which the commercial Internet has fundamentally transformed business and the economy is by enabling the creation of entirely new business models or the application of age-old business models in ways never before possible. As David Newkirk, former CEO of consulting firm Booz Allen Hamilton, argues, “Ubiquitous connectivity has opened the floodgates of business model experimentation.”¹⁶² Indeed, the Internet has enabled the creation of business models that have rewritten the rules of entire industries, such as advertising. Many of these business models enable more efficient allocation of goods and services.

Many of these Internet-enabled or -empowered business models shift the boundaries of which party performs certain tasks in a value chain. This boundary-shifting is usually based on new possibilities created by the Internet or back-office IT systems.¹⁶³ In some cases, the service firm takes over some part of the customer’s complexity, enabling the client to focus on its core business activity (for example, outsourced network management services offered by firms like Cisco Systems). In other cases, the service firm innovates by having the customer perform roles the company once performed (such as having customers select their

own seats for a flight). If information technology is the production department of the services-era in much the same way factories and machines were for the goods-era, then the Internet serves as the trucks and roads of the Internet economy, connecting customers to a vast array of products and services.¹⁶⁴

Table 9 lists 15 distinct business models (described subsequently) either substantially enabled or empowered by the commercial Internet. A number of dot-coms employ several of these business models simultaneously.

Table 9: Internet-enabled business models¹⁶⁵

Internet-Enabled or Empowered Business Model	Definition	Examples of Companies Using Internet-Enabled Business Model
E-Delivery	Uses IT to undercut business models based on physical delivery.	E*TRADE, LendingTree.com, Esurance.com, ING Bank, NetFlix, iTunes, PayPal
Fractional ownership	Uses the Web to enable fractional ownership of capital assets, with the Internet enabling scheduling in time increments not previously practical.	ZipCar, FlexCar, NetJets, FlexJet
Marketing of excess capacity	Business models, often leveraging ICT, that identify and sell unused capacity.	Priceline.com, Total Quality Logistics, Lastminute.com
Dynamic pricing	Adjusts prices online in real-time in response to fluctuating supply or demand variables.	Dell, Amazon
Auction or matching markets leveraging the aggregation of supply and demand markets	Aggregates consumer demand and supply for products or services in one location, allocating supply and demand through auctions or matching.	eBay, Monster.com, Match.com, Expedia, GSA Auctions, Chemconnect
Create a new, Web-based platform for commerce	Uses the Internet to create an entirely new platform for commerce, monetized by inviting third parties to participate through it.	eBay, Amazon, Sitoo
Outsourcing and Cloud Computing	Company assumes complexity, capacity, or hosts services on behalf of client.	IBM e-Business On Demand, Amazon Web Services
Software-as-a-service	Enterprise-application software that customers do not have to license, but can access online over the Internet.	Salesforce.com, Google Apps
Pay-per-use plans	On-demand or per-pay-use services.	Progressive Insurance "Trip Sense" Program
Information-based, targeted offers	Uses data mining to develop targeted offers or services.	Collaborative filtering by Amazon, NetFlix, and Rhapsody
Mass customization	Uses ICT systems to introduce "mass produced, yet customized," also known as "mass customized" services.	Dell, Nike, Mini, Dow Corning
Anytime services	Internet enables always on availability of services.	Phoenix University, Concord School of Law, Cisco Systems, Ingram Micro
Ad-supported search, content, and services	Free content or search services for Web users supported by paid business advertising.	Google, Yahoo!
Social media/social marketplaces	Create a meeting place for people, enabling transactions.	Facebook, LinkedIn, Twitter, MySpace
Referral-based models	Receive a fee each time a sale is made through the referring Web site.	Weddingchannel.com, Yesmail

E-DELIVERY

E-delivery business models use the Internet to compete with business models that rely on physical presence or physical delivery to provide goods or services. A number of new financial services start-ups, including E*TRADE, Lendingtree.com, Esurance.com, and ING Bank, emerged to offer what they hoped to be more competitive Internet-based financial services business models because these firms did not have to support the financial overhead of physical retail locations. The success of these four businesses bears out the credibility of online business models in online trading, lending, insurance, and banking delivery. (Though certainly some early businesses such as Netbank failed in their efforts to market online financial services, many succeeded in establishing viable, sustainable online financial services delivery models.) No doubt the success of these Internet-based financial services start-ups contributed to driving established financial services firms into more quickly adopting the Internet and offering their own services online. Interestingly, Dutch financial services provider ING Bank was one of the very first in the world to offer customers online banking services. But ING had to introduce the service in the United States because Dutch officials, fearing the impact online banking would have on the employment of bank tellers, initially limited the introduction of Internet banking in The Netherlands.

The total consumer welfare gained from variety in books online has been estimated at \$731 million to \$1.03 billion annually, which represents between seven to ten times more welfare than consumers receive from just having access to lower prices online.

E-delivery models have been applied across a wide variety of industries to decrease the costs of physical overhead and to make the conversion from delivering physical products to digital goods. Services like iTunes have revolutionized the digital distribution of music and, increasingly, videos and television shows. Amazon successfully applied the model to compete with brick-and-mortar book retailers such as Borders and Barnes and Noble, as did Netflix against established video rental competitors Blockbuster and Hollywood Entertainment. As with financial services firms, the success of these Internet-based models drove established brick-and-mortar players to offer Internet-based offerings themselves.

Not only has Internet-based delivery changed the fundamental cost structure of these industries, it has opened up the opportunity for dot-coms to offer a far wider range of products to cater to the “long tail” of the marketplace. While brick-and-mortar book or music stores can only keep a finite inventory of titles on-site, the long tail refers to the ability of Web-based merchants to offer a much broader selection, opening up the opportunity to monetize the sale of more obscure, less-frequently demanded titles that would not be economical to stock in retail environments. The “Long Tail Theory,” developed in 2004 by *Wired* editor-in-chief Chris Anderson, goes a step further, suggesting that, as the

Internet makes distribution easier (and makes consumers more aware of more obscure products) demand will shift from the most popular products at the “head” of a demand curve to the aggregate power of a long “tail” made up of demand for many different niche products.¹⁶⁶

For example, while a typical large brick-and-mortar store carries 40,000 to 100,000 book titles, Amazon.com carries over 3 million.¹⁶⁷ This variety is possible because Amazon’s large centralized inventories and market allow it to stock books that might not sell many copies in a year and would be prohibitively expensive to stock in a brick-and-mortar store. The total consumer welfare gained from this variety in books alone was between \$731 million to \$1.03 billion in 2000, which represents between seven to ten times more welfare than consumers receive from just having access to lower prices online.¹⁶⁸ Of course, Amazon now sells electronic books (e-books) as well via its Kindle e-book reader, of which Amazon has already sold more than 3 million.¹⁶⁹ Amazon carries over 400,000 e-book titles, and finds that (when it carries both physical and e-book titles) it sells six Kindle books for every ten physical books.¹⁷⁰

The long tail doesn’t occur just in book retail, it applies for virtually any product distributed on the Web, from music to videos. For example, Posters.com stocks over 300,000 different posters. Ties.com stocks over 2,500 different ties. Online DVD rental site Netflix stocks over 100,000 different DVD titles, compared with a typical neighborhood video store that stocks around 3,000. Approximately 40 percent of sales at online music service Rhapsody are songs that are not available in brick-and-mortar music stores.¹⁷¹

Looking at the Long Tail Theory in depth in 2009, researchers at the University of Pennsylvania’s Wharton School of Business found mixed evidence. For example, data provided by Netflix of customers using its Web-based movie rental service revealed that 15 percent of total demand came from titles beyond the top 3,000, the amount typically stocked in a video store.¹⁷² However, despite the fact that the number of peer-rated movie titles available from Netflix increased from 4,470 in 2000 to 17,768 in 2005, the researchers found that demand for the top 20 percent of movies increased from 86 percent in 2000 to 90 percent in 2005, suggesting that the traditional “80-20” rule may outperform the Long Tail Theory in explaining the distribution of online movie rentals.¹⁷³ Regardless, it is unquestioned that the Internet has created unprecedented opportunities to cater to long tail markets by substantially decreasing the marginal cost of doing so.

FRACTIONAL OWNERSHIP

Fractional ownership models, such as time shares for condominiums, have long existed, but before the Internet’s arrival they had not been widely applied to a wide range of capital assets such as automobiles (ZipCar and FlexCar) or private jets (NetJets and FlexJet). Not only does the Internet enable companies like ZipCar to aggregate local demand for vehicles, it also allows

access to the vehicles to be scheduled in time increments not previously practical with fractional ownership models. It's one thing for a property management company to manage 52 one-week visits to time-shared condominiums a year; it's another thing entirely to schedule ZipCar reservations in half-hour increments. NetJets pioneered the concept of fractional jet ownership, giving individuals and businesses all the benefits of whole aircraft ownership at a fraction of the cost.¹⁷⁴ FlexJet also offers fractional ownership of private jets, with share sizes starting at 1/16 of an aircraft (equivalent to 50 flight hours per year). One can make private jet reservations with as little as six hours' notice.¹⁷⁵ Other dot-coms have applied Web-based fractional ownership models to farm services equipment, yachts, prestige cars, and of course, vacation homes.

A study of over 4,500 eBay auctions found that consumers extract a median surplus of at least \$4 per eBay auction, generating up to \$7.05 billion in total consumer surplus annually.

Likewise, house matching sites like CouchSurfing.com facilitate matching between travelers and residents willing to spare a bedroom or a couch, or just have a chat with travelers passing through.¹⁷⁶ Other online sites let travelers exchange places to stay. A person visiting Paris can stay in the house of a person there who is on vacation, as long as the visitor in turn lets someone stay in his house at home. Such systems expand the output of the lodging "industry" without requiring any new hotel rooms.

MARKETING OF EXCESS CAPACITY

The Internet offers a novel channel for firms to market their excess capacity. Priceline.com allows airlines to sell their unsold seats and hotels to place their inventory of unsold accommodations online, empowering customers to negotiate for these services in a number of ways, including by making binding bids for reservations. Other Web sites such as Lastminute.com display unused inventory for events and tourist attractions in addition to flights and hotel reservations.

The Internet has actually had a profound impact on the long-haul freight trucking industry. Because of difficulty in predicting demand, transportation equipment is often underutilized. For example, trucks might be fully loaded for delivery, but might make the return trip partially or completely empty. Indeed, about one-fifth of trucks at any one time are "transporting air."¹⁷⁷ Because of the Internet, trucks can operate more efficiently. Web sites like Getloaded.com and Internet Truckstop.com act as a matching service, precluding excess capacity from going to waste by connecting truckers that would otherwise be traveling empty with loads that need to go to the same destination.¹⁷⁸ One study found that on-board computers linked to the Internet allow managers to better coordinate trucks, boost capacity utilization by 3.3 percent, and have saved \$16 billion annually in the \$500 billion trucking industry.¹⁷⁹ As a result, this has reduced the

overall number of miles driven and thus reduced the carbon footprint of the industry relative to what it would have been without the technology. Ohio-based Total Quality Logistics has built an almost billion dollar business in part through leveraging the Internet to facilitate the shipment of less-than-truckload freight in the United States.¹⁸⁰

DYNAMIC PRICING

Dynamic pricing allows companies to operate more efficiently by pricing their product differently depending on different variables and by using pricing to better control demand. Many brick-and-mortar retailers already do this. For example, department stores regularly have end-of-year clearance sales to quickly move out last year's inventory. But using the Internet, businesses can implement much more granular dynamic pricing strategies. For example, Dell can lower or raise its prices based on factors such as fluctuations in costs, availability of components in its supply chain, and changing customer demand. Buy.com, a low-price online retailer, frequently changes pricing on its handheld products in response to changing market conditions. Dynamic pricing delivers two main benefits for companies. First, it provides new opportunities for customers to maximize their return per customer because, by lowering the "menu cost" (the cost of displaying prices to customers), companies can post and frequently change prices for different channels and product configurations. Secondly, dynamic pricing can bring better returns on deployed assets. That is, with dynamic pricing, companies can encourage demand in slow periods and discourage it, if necessary, during peak periods (for example, if peak demand is causing bottlenecks in the supply chain for critical components).¹⁸¹ Of course, firms can also leverage dynamic pricing as another avenue to market excess capacity.

SIMULTANEOUS AGGREGATION OF SUPPLY AND DEMAND MARKETS

The Internet enables the simultaneous aggregation of both supply and demand for almost all industries on a scale never before possible, dramatically extending the applicability and power of both auction and matching markets. For example, eBay leveraged the Internet to become the world's largest online marketplace, where practically anyone can buy and sell practically anything, with the total worth of goods sold on eBay in 2009 amounting to \$60 billion, or \$2,000 every second.¹⁸² Bapna, Jank, and Shmueli found that (based on a study of 4,514 eBay auctions), consumers extract a median surplus of at least \$4 per eBay auction. Their study found that eBay's auctions generate up to \$7.05 billion in total consumer surplus annually.¹⁸³

In effect, online jobs sites such as Monster.com, CareerBuilder, and The Ladders reflect the demand and supply aggregation model, seeking to connect job seekers with employers. eHarmony and Match.com offer similar matching services for dating. Such aggregation models can be found for any number of industries and sectors online, from used oil and gas field services

equipment at Oilfield-auction.com to apparel and electronics at Overstock.com. The Pan European Fish Auction (Pefa.com) directly links fish retailers to fish harvesting companies through real-time auctions.¹⁸⁴ Chemconnect.com connects buyers and sellers of chemicals into a more efficient online market.¹⁸⁵ Though not a dot-com, even the U.S. government offers the general public the opportunity to bid electronically on a wide array of surplus, seized, or forfeited federal assets at GSAAuctions.gov.

NEW WEB-BASED PLATFORMS FOR COMMERCE

eBay, however, represents more than just an auction market. It has become an entirely new online platform for commerce, to the extent that 724,000 Americans report that their businesses or transactions on eBay constitute their primary or secondary source of income.¹⁸⁶ Amazon.com represents a similar platform for commerce by allowing affiliated associates to sell products online, in direct competition to Amazon's offerings. As many as 8 million individuals sell books through Amazon's platform.¹⁸⁷

The start-up Sitoa.com has built a similar Web-based commerce platform. Sitoa built a Web-based, transactional "e-tailing" engine that seamlessly connects online retailers with product suppliers in the e-commerce marketplace. Sitoa's e-tailing engine allows product suppliers to easily load their product inventory onto Sitoa's Web-based platform, which online retailers can readily visit to select and upload products they want to sell on their Web sites. A key insight behind Sitoa's "One Source Model" is that the supplier handles order fulfillment directly on behalf of the online retailer, shipping products purchased through the retailer's site directly to the customer. This "supplier-direct fulfillment model" offers two advantages: 1) The online retailer need not maintain extensive and expensive inventories at its location, and 2) Because the online retailer need not manage physical inventory, it can sell inventory-intensive product categories online, allowing the online retailer to offer a much greater diversity of product categories through its Web site. By enabling them to market a much richer set of products, Sitoa helps online retailers realize incremental revenues and increased profits.¹⁸⁸ In essence, Sitoa.com has significantly reduced the cost structure of online selling by creating a technology platform that seamlessly links network nodes—online retailers and their product suppliers—through direct data transfer via the Internet. It should also be noted that this is another manifestation of electronic data interchange (EDI) moving to a Web-based platform. As Sitoa CFO Eric Hassman explains, "America's largest retailers have more than 30,000 suppliers, but they only electronically integrate about sixteen of these suppliers a year into their data systems. Our system can get new suppliers set up and connected with hundreds of retailers in as little as a few hours."¹⁸⁹

OUTSOURCING AND CLOUD-COMPUTING

The Internet empowers a number of outsourcing-based business models. For example, IBM's e-Business on Demand services allow clients the flexibility to access scaled computing services when needed, such as to manage peak periods of demand, instead of

having to over-purchase depreciating capital assets. For example, mainframes are idle 40 percent of the time, UNIX servers are idle 90 percent of the time, and PCs are idle 95 percent of the time.¹⁹⁰ The Internet thus allows corporations to tap into additional computing power on an as-needed basis. Another manifestation of this model is grid computing, which enables the sharing, selection, and aggregation of a wide variety of geographically distributed computational resources (such as supercomputers, compute clusters, storage systems, and data sources) and presents them as a single, unified resource for solving large-scale and data intensive computing applications (e.g. molecular modeling for drug design, brain activity analysis, and high energy physics).¹⁹¹ In contrast to grid computing, which leverages the Internet to aggregate the computing power of otherwise dormant machines, cloud computing describes a new delivery and consumption model for IT services based on the Internet, typically involving the provision of dynamically scalable and often virtualized resources as a service over the Internet.¹⁹² For example, Amazon offers a suite of cloud computing services called Amazon Web Services that allows companies to dynamically requisition computing and storage resources to meet current demand. For example, using Amazon Simple Storage, a company can "store and retrieve any amount of data, at any time, from anywhere on the Web."¹⁹³ Using cloud computing, companies can better manage spikes in demand so that the Web service itself can automatically scale up or down to ensure best performance while only paying for the resources they use.

SOFTWARE-AS-A-SERVICE

Cloud computing dramatically empowers the potential for software-as-a-service (SaaS) business models, such as those offered by Salesforce.com or Google. SaaS enables customers to access enterprise application software via the Internet, often without having to acquire an enterprise site license. SaaS business models leverage the Internet to deliver software applications that once were sold as shrink-wrapped software with the application installed and managed on the user's PC desktop. Delivering such applications through the Internet confers a number of benefits: software and system updates can be performed behind the scenes, without requiring customers to install new software versions, and customers can access their applications and data anywhere they can connect to the Internet, without having to be tied to a desktop. More fundamentally, SaaS allows companies to shift to a subscription-based, pay-as-you-go business model from a shrink-wrapped software sales model. For example, Salesforce.com has revolutionized the customer relationship management (CRM) market by offering Web-based CRM services. The SaaS market was believed to have grown to a \$6.3 billion global market by 2006, and was expected to reach \$7.7 billion in 2007.¹⁹⁴ Google Apps is a Web-based word processor, spreadsheet, presentation, and data storage service allowing users to create and edit documents online while collaborating in real-time with other users. Microsoft's Office 2010, the newest version of the company's venerable office productivity software, will also make its Word, Excel, PowerPoint, and Outlook applications Web-deliverable.

PAY-PER-USE PLANS

Connecting the Internet to physical devices enables such pay-as-you-go business models to be applied to entirely new industries. For example, Progressive's TripSense service uses a device plugged into a USB port on a vehicle to collect actual information on a motorist's driving behavior, such as how many miles are driven, when the motorist is driving, at what speeds, and whether there are excessive instances of extreme acceleration or deceleration. At monthly intervals, drivers remove the device from the vehicle, insert it into their computer, and upload the data via the Internet to Progressive, which adjusts the driver's insurance rates based upon their demonstrated safe driving behavior. This enables Progressive to reward drivers with lower premiums for traveling less, or more safely. As the Internet enables businesses to network together a multitude of devices and sensors, a wealth of similar new services and business models are likely to emerge.

COLLABORATIVE FILTERING AND INFORMATION-BASED, TARGETED OFFERS

Through information-based, targeted offers, companies can build business models based on using sophisticated data mining to develop targeted offers and services. Perhaps the most celebrated example is Amazon's collaborative filtering approach, which makes book recommendations to customers by combining knowledge of the customer's past selections with similar purchases made by other customers displaying similar interests. A number of dot-coms have applied the collaborative filtering principle, including Netflix to make film recommendations based on the movie genres or most common actors or actresses in the films one watches most often. Rhapsody.com and Apple's iTunes Genius feature make music recommendations on a similar basis. Netflix has devoted substantial resources towards improving its predictions of user's ratings of movies, including sponsoring a \$1 million competition to develop an algorithm that would lead to a 10 percent improvement in predicting the ratings its customers will give to movies.¹⁹⁵

MASS CUSTOMIZATION

The Internet dramatically expands firms' ability to mass produce customized products and services for customers. Dell Computer pioneered this approach with its use of the Internet to enable build-to-order personal computers. Interestingly, the most profitable aspect of Dell's business model was not simply the mass customization aspect, it was that Dell could also reduce its inventory and recognize income before having to pay suppliers. That is, when customers completed their custom-configured online order, they paid for the item in full at check-out. Only then would Dell turn around and order the specific components from parts suppliers, dramatically reducing the amount of inventory Dell had to keep on hand. Moreover, Dell recognized revenue from the consumer's purchase immediately, often days before the customer received the final product or vendors had to be paid, significantly enhancing the firm's cash flow position vis-à-vis competitors.

Web-based build-to-order business models have since been applied to any number of products and services. Lands' End lets customers submit measurements online to receive custom-fit clothing and Nike's Web site allows customization of athletic footwear. American Quantum Cycles lets customers order bikes online to fit their unique measurements. Using the Internet to receive orders, CafePress takes basic commodities like t-shirts, hats, and coffee mugs, and then prints onto them designs submitted by customers.¹⁹⁶ Parypongtable.com lets users design their own game tables, including the type of legs, logos, etc. Web site digitalforming.com goes a step further. Proclaiming that they are democratizing personal objects, the site provides three-dimensional software solutions to help individuals co-create and co-design products with professional designers.

Many Internet-enabled business models shift the boundaries of which parties perform certain tasks in a value chain, with this boundary-shifting usually based on possibilities created by the Internet or back-office IT systems.

The BMW-owned Mini brand popularized the practice of allowing customers to design their own vehicles over the Internet. Scion (a Toyota brand) adopted this practice and is probably the second-most mass customized automobile brand in the world. CATER is an initiative launched by European and Asian players in the automotive field to develop an integrated system for mass customization of vehicles, including through online configuration.¹⁹⁷ Unfortunately, American automobile manufacturers have limited ability to offer build-to-order, mass customized automobiles over the Internet due to automobile franchise laws in all 50 U.S. states that prohibit U.S. automobile manufacturers from selling vehicles directly to customers over the Internet (rather than through locally franchised dealers).¹⁹⁸ Such regulations harm consumers and automobile manufacturers alike.

Established manufacturers have also thoroughly incorporated Web-based build-to-order systems into their supply chains. For example, generator-making giant GE Power Systems has installed one of the world's largest manufacturing execution systems (MES). GE Power Systems has implemented the near-paperless, digital-based, build-to-order MES at its plants worldwide.¹⁹⁹ To help its dealers manage inventories more effectively, General Motors developed a service called SmartAuction. For vehicles that are coming off lease, SmartAuction asks customers to bring in cars for inspection before the lease expires. The condition of the car is logged into the system and sent to GM dealers who use it to purchase cars electronically. The system helps dealers find cars that fit their target audience, manages the auto-titling process, and shortens the time cars are carried in inventory.²⁰⁰

Dow Corning's Xiameter Web-based business model, which offers customers a self-service option for purchasing silicone products and applications over the Internet, was hailed by one Harvard Business Review case study as a "major transformative success" that "re-invented the company."²⁰¹ As the case study noted, Dow's business model had been "based on high-priced, innovative product and service packages...but many customers experienced in silicone applications no longer needed technical services; they needed basic products at low prices." Dow leveraged the Internet to create a fundamentally lower cost structure dependent upon a new IT system that offered a standardized, self-service process for its customers. Whereas Dow Corning had previously had no online sales component, 30 percent of the company's sales now originate online, nearly three times the industry average.²⁰²

ANYTIME SERVICES

The Internet further enables an entirely new set of anytime, always available services across a range of industries. For example, the University of Phoenix offers online college education. The Concord School of Law allows students to complete a law degree over the Internet. As they note, the "law degree curriculum is available 24-7; before dawn, on your lunch hour, or after work."²⁰³ The National Center for Education Statistics estimated that there were a total of 12.2 million enrollments in college-level credit-granting distance education courses in 2006–2007. Of these enrollments, 77 percent were reported in online courses, 12 percent were reported in hybrid/blended online courses, and 10 percent were reported in other types of distance education courses.²⁰⁴ As of February 2009, e-learning was estimated to represent about 10 percent of the overall U.S. training and educational market.²⁰⁵

Another type of Internet-enabled "anytime, always on" (and outsourcing) business model would be managed network services, such as those offered by Cisco Systems, Ingram Micro, or Rackspace.com. Such services include, for example, remote network monitoring and management services for small enterprises. Such services can proactively diagnose failure modes in advance, performing system maintenance before network outages occur, or can fix network or computing system problems remotely, without having to send a technician onsite. Managed services can help businesses reduce overall network costs by 15 to 25 percent.²⁰⁶ The total U.S. managed network services industry grew from \$7.9 billion in revenue in 2000 to \$31.4 billion by 2006, a compound annual growth rate of 22.4 percent.²⁰⁷

AD-SUPPORTED SEARCH

Led by Google, the Internet-based, ad-supported-search business model has revolutionized the advertising industry.

Indeed, online advertising, a \$40 billion industry in 2008, is projected to double into an \$80 billion industry globally by 2011.²⁰⁸ The old saw in the advertising industry went, "We know half of our advertising budget is wasted; we just don't know which half." One of Google's breakthroughs was to leverage the Internet to give advertising customers real-time visibility into the effectiveness of their targeted advertising campaigns. That is, they leverage real-time information to let advertisers know which ads are working and which aren't. Google leveraged that breakthrough to become the highest market-valued corporation in the world. Overall, four of the five most trafficked Web sites in the United States are ad-supported search engine/portals, including Google, Yahoo!, msn.com, and Ask.com.²⁰⁹

SOCIAL MEDIA

The Internet has spawned a number of dot-coms leveraging social media-based business models that offer an online meeting place for people and monetize the destination through transactions or advertising. Facebook, LinkedIn, Twitter, and MySpace are but a few such Web sites, and they are beginning to generate revenue. Facebook expects to make at least \$500 million in 2009, and a recent investment in the firm by a Russian investor group placed the firm's valuation at over \$10 billion.²¹⁰ (A 2007 Microsoft investment valued Facebook's preferred stock at approximately \$15 billion.) No doubt the spread of social media dot-coms has powered the Web 2.0 vision of the Internet.

REFERRAL-BASED BUSINESS MODELS

One of the earliest Web-based business models was the referral model, which paid affiliate sites to direct traffic to target Web sites. This model very much dominated the early days of the Internet when Web sites were largely valued on the number of "eyeballs" they attracted. Nevertheless, referral-based business models remain viable on the Internet. For example, WeddingChannel.com provides a bridal registry where wedding guests can buy gifts from companies such as Tiffany's, Macy's, or Crate & Barrel, with WeddingChannel.com receiving a fee each time a sale is made through its Web site.²¹¹ Yesmail.com, which generates leads using e-mail marketing, represents another referral-based example.²¹²

In summary, the Internet enables a wealth of novel customer value propositions and business models, including those that enable businesses to manage some element of their client's complexity, enhance their productivity, increase transparency, remove or minimize business uncertainty, create multi-directional value propositions, maximize capacity utilization, or proactively anticipate and predict (or even repair) failure modes in advance.²¹³ The following section analyzes the overall economic impact of the commercial Internet.

THE ECONOMIC BENEFITS OF THE INTERNET ECONOMY



Web-order fulfillment center

Most recognize that the Internet has transformed our lives and revolutionized commerce. The commercialization of the Internet has led to a wide array of benefits for consumers, businesses, and the economy at large. But what is the Internet economy? Defining it is more art than science. Distinguishing the Internet economy from the IT economy is difficult given the overlap between the two. The Internet economy is clearly a subset of the IT economy. For example, while Amazon.com is clearly part of the Internet economy, a computer-enabled machine tool in a factory is not. This report focuses on the parts of the economy enabled by the commercial use of the Internet, ignoring other uses such as the general use of IT or the Internet by non-profits and governments. But even with this focus, much of the benefits of the commercial Internet are underreported. For example, as MIT professor Erik Brynjolfsson notes, the total value that consumers get from Internet searches is not counted in any official output statistics, and thus far no research has even attempted to quantify it.²¹⁴

This much is certain: before the dot-com era, companies were severely limited in their ability to conduct business electronically. Businesses that wanted to achieve greater efficiencies through using electronic means of communication were restricted to faxes, phones, and private networks used for electronic data interchange. Likewise, before the dot-com era, consumers had fewer choices, less information, and less power to influence prices and the quality of goods and services. As the next two sections

of this report will document, the Internet economy has been, and will likely continue to be, one of the principal drivers of economic growth and quality of life for societies throughout the world. This section on the economic impacts of the commercial internet estimates the economic benefits of the commercial Internet and then examines how the Internet economy helps consumers, how it helps firms and workers, and how the Internet industry itself contributes value directly to economies.

ESTIMATING THE ECONOMIC BENEFITS OF THE COMMERCIAL INTERNET

The IT revolution has had a major impact on the global economy. For example, ITIF has estimated that because of the impact of the IT revolution, the U.S. economy is approximately \$2 trillion larger in terms of annual GDP than it would be otherwise. But this measurement includes not just e-commerce and the activities of the commercial Internet, but also other IT impacts, such as the use of electronic kiosks, more efficient IT-enabled machines in factories, and software systems in enterprises.

Measuring the economic impact of the Internet economy, in contrast, is a more complex task. In large part, this is because it is difficult to measure only the e-commerce component of the IT economy. However, given existing data it is possible to come up with a general estimate of the impact of the commercial Internet on both overall GDP and consumer welfare. This report does this not by measuring the direct economic impact of Internet firms (e.g. the Yahoo's! and Google's of the world). In some ways the shift of economic activity to the Internet industry cannot be counted as an economic benefit, because if this economic activity did not take place in the Internet industry, it would occur somewhere else (people might buy more consumer electronics or clothing, for example).

However, what one can and should measure is the impact of the commercial Internet on productivity and therefore GDP. Estimates vary depending on the study and methodology. One study found that the cost savings from global business use of e-commerce were \$1.25 trillion by just the mid-2000s, at a time when global e-commerce transactions were around \$4.9 trillion, for a savings ratio of 25 percent.²¹⁵ A UK study found that firms that engage in both e-purchasing and e-selling had 15 percent higher value added per worker, equivalent to reducing the cost of goods sold by around 5 percent.²¹⁶ With average e-commerce sales amounting to 15 percent of total retail sales, the savings ratio is 33 cents per dollar of e-commerce transactions. Another study estimated that e-commerce reduced the cost of goods sold by approximately 7 percent in the United States. With average e-commerce sales of 16 percent, the savings ratio is 43 cents per dollar of e-commerce transactions.²¹⁷ Cost savings in Germany, the United Kingdom, and France were lower, on the order of 5 percent of the cost of goods sold. With average e-commerce sales of 14 percent, the savings ratio is approximately 35 percent.

Litan *et al.* estimated that the commercial Internet would lead U.S. GDP to be \$590 billion larger than it would be in its absence.²¹⁸ This amounts to 4 percent of GDP and 15 percent of overall e-commerce transactions. Therefore, using a conservative estimate, it seems reasonable to use a savings ratio of 15 percent per dollar of e-commerce.

In 2010, global e-commerce activity totaled an estimated \$10 trillion. Using an estimated savings of 15 percent, this means that without the commercial Internet, the global economy would be \$1.5 trillion smaller than it would be otherwise. The share of

e-commerce conducted through dot-com domains is smaller, however ITIF estimates that it is still substantial, generating an estimated \$400 billion in economic benefits annually throughout the world, an amount that is expected to grow to at least \$950 billion annually by 2020.²¹⁹ To put this into perspective, the economic benefits of the commercial Internet are larger than the global sales of medicine, investment in renewable energy, and government investment in R&D, combined.²²⁰ And if e-commerce continues to grow annually half as fast as it grew between 2005 and 2010, then by 2020 global e-commerce will reach \$24.2 trillion, and will add roughly \$3.8 trillion annually to the global economy—more than the total GDP of Germany.

THE INTERNET ECONOMY HELPS CONSUMERS

The commercial Internet has provided the most significant improvements in consumer welfare since the emergence of the post-World War II mass production economy. Consumers today are able to make better decisions, obtain more products and services (many of which did not exist before the Internet), and enjoy more convenience.

Making Markets More Efficient by Expanding Consumer Access to Information

Over the past century, a host of institutional innovations have emerged to provide consumers information and assurance about the products and services they were considering buying, from advertising to warranties to publications like *Consumer Reports*. But nothing has revolutionized shopping quite like the Internet. Consumers equipped with knowledge about a product's price, availability, and quality can find the best combination of goods and services for their money. The Internet has moved consumer empowerment to a new level by lowering the main hurdle to getting comprehensive information on prices and products: search costs. The Internet makes it dramatically easier to find information on products and services, including prices and quality. For example, by using Google's or Bing's shopping search engines, consumers can easily compare prices for the same item or service. Now, instead of relying on the Sunday paper to learn when sales are happening, one can quickly and easily compare prices among multiple stores online.

Online tools to compare life insurance policies between providers have reduced on- and off-line prices of life insurance by 8 to 15 percent, producing a consumer surplus of \$115 to \$215 million annually.

Saving Money: A number of studies have shown that e-commerce saves consumers money. For example, buying contact lenses over the Internet enables consumers to save between 10 and 40 percent of the cost of buying from an optometrist.²²¹ A Yale University study found that the average customer using an online service to buy a vehicle pays approximately 2 percent less than someone buying in person from a dealer; these savings would likely be even greater if consumers could go online and buy a

car directly from the manufacturer.²²² Studies have even found that, on average, prices at pure-play e-tailers are lower than at brick-and-click e-tailers.²²³ By establishing more cost-efficient operations online—especially by reducing the costs of acquiring and maintaining expensive physical retail locations—the Internet enables pure-play dot-coms like Amazon and Netflix to offer ever more competitive pricing, exerting further downward pressure on consumer prices for books, movie rentals, music, and the many other products and services sold online.

Even if they purchase from a brick-and-mortar store, Internet users can still benefit. For example, when consumers want to know where the cheapest gas is they can go to GasBuddy.com. The site collects real-time prices from some 750,000 volunteer price “spotters,” who send in daily updates from their local stations. With prices varying by up to 50 cents from one gas station to the next in some cities, it pays to stay informed.

This increased ease of price comparison leads to significant savings for consumers. Price comparison Web sites make consumers more sensitive to prices, reducing price dispersion and increasing the relative importance of differences in retail services, such as delivery options and ease of Web site use, in deciding whom to buy from.²²⁴ For example, online tools to compare life insurance policies between providers have reduced on- and off-line prices of life insurance by 8 to 15 percent, producing a consumer surplus of \$115 to \$215 million annually.²²⁵ Overall, the ease with which consumers can compare prices online has made consumer demand extremely price-sensitive and led companies to lower prices.²²⁶ This increase in bargaining power by Internet-empowered consumers is one reason why the Pew Research Center's Internet & American Life project found that 32 percent of online Americans say that the Internet has greatly improved their ability to shop.²²⁷

Consumers Trump Madison Ave.: The Internet also makes it easier for consumers to get more information to make better purchasing decisions. In the past, brands were one way consumers could gain assurance of product or service quality. But establishing brand reputations can be quite expensive and can lead to higher prices. However, the increased information available through Internet shopping and third-party product review sites has decreased the effectiveness of branding.²²⁸ With the Internet, consumers no longer need to rely on past performance of producers or celebrity endorsements to make their purchasing decisions. Customers' online reviews provide information on products and services independent of producers. Community rating systems allow consumers to get recommendations on the kinds of books or movies they might like based on what other, similar users liked. Consumers can also use the Internet to try a product before they buy it. For example, readers can preview many books at Google, Amazon, or BarnesandNoble.com. Overall, two-thirds of U.S. consumers use the Internet to research purchases before going to the store.²²⁹

Ads Just for You: Another way in which the Internet increases consumer information is by enabling more targeted advertising.

Instead of being subjected to irrelevant ads for products most consumers would never want or need, targeted online ads are more likely to appear for items in which a consumer is likely to have a real interest. For example, with Google AdSense, advertisers can advertise to only those people who have demonstrated through their search terms that they are interested in the advertised product type.²³⁰ And targeted online ads can be integrated into many types of Web sites. For example, if a person has booked several trips to Las Vegas several times a year on a travel Web site, the next time the person goes to the site it can display special Las Vegas flight and hotel packages. Such targeted marketing not only is much more likely to provide information of value to a consumer, it significantly increases the value of the marketing to the companies, thereby lowering the relative cost of advertising and further reducing prices.

Lowering Prices by Enabling Self-service

Thirty years ago, futurist Alvin Toffler predicted the rise of “prosumers”—consumers who share in the production process when they consume. But it took the rise of the Internet economy for his prediction to come true. Today, self-service is a vitally important part of the economy.

Consumers can use the Internet to do for themselves what they used to have to pay professionals to do for them. For example, individuals can use self-service technology for their legal needs. Using online legal services, individuals can draw up a will, lease, or other simple contract and save 75 to 80 percent over using a lawyer.²³¹ Similarly, individuals can use companies such as E*TRADE or Charles Schwab for Internet stock trading, rather than using a stockbroker. Moreover, for individuals looking to manage their own money, investment strategies were once limited by the lack of access to robust, real-time information. Now many individuals choose to forgo stockbrokers to manage their own investments because there is very little information available to professionals that cannot be found by amateurs through online research. Moreover, purchasing a stock or bond now requires only a few clicks online. In Japan, online trading has exploded, with the number of accounts at Japanese electronic brokerage firms growing from fewer than 300,000 to nearly 8 million since 1999, with Internet trading now accounting for more than one-quarter of all equity trades in the country.²³² Using the Internet for equity trading has contributed to the price of equity trading declining by as much as 90 percent.²³³ Between 10 and 20 percent of U.S. equity trading now occurs over the Internet.²³⁴

Self-service technology also allows consumers to take on many of the functions provided by travel agents. Consumers can research and plan their own itineraries using the thousands of online resources that offer detailed information about destinations. Web sites like Orbitz and Expedia let consumers bypass travel agents and directly make air, hotel, and car reservations. Neither must consumers rely on the advice of a single agent for travel recommendations—Web sites like TripAdvisor, Virtual Tourist, and IgoUgo offer detailed suggestions on where to stay, what to eat, and where to visit while traveling. As a result, the use of

travel agents has declined substantially. Today only 25 percent of car rentals, 30 percent of hotels, and 50 percent of airline tickets are booked through travel agents.²³⁵

Consumers also use the Internet to purchase insurance, a task once only fulfilled by an insurance agent or broker. Using the Internet, consumers can research costs and benefits of various types of insurance, including property, life, health, disability and long-term care, rather than relying exclusively on an agent for this service. Consumers can use online tools to request quotes and submit applications. For example, Geico offers discounted insurance, in part because it is able to have its customers use self-service options to manage their insurance. Using the Geico Web site, policyholders can view their current insurance options and policy documents, make changes to their policies, such as changing a deductible or modifying their coverage, and make an online payment. As a result of self-service technology, insurance agents and brokers can service more clients and spend their time on more complex issues, such as answering insurance questions. U.S. insurance companies issued 2 million online quotes for life insurance in 2009.²³⁶

Using the Internet for equity trading has contributed to the price of equity trading declining by as much as 90 percent.

Intuit's TurboTax software has revolutionized the tax preparation business by offering a CD-ROM and online software application with as much tax expertise as a typical tax accountant, but at a considerably lower price. Using e-filing software also yields more accurate tax returns for taxpayers; the error rate on tax returns submitted by paper is 20 percent, compared to an error rate of less than 1 percent for electronic returns.²³⁷ In addition, because the private companies that make electronic filing software are competing intensely for market share, they have strong incentives to make their programs as easy to use and comprehensive as possible.

Home buyers and sellers can take advantage of self-service options offered by real estate companies to accomplish for themselves what they used to have to pay a real estate agent to do. Improved access to information also allows individuals to learn about properties without having to be physically present. Virtual tours of houses, for example, save prospective homebuyers hours on the road going from property to property by letting them first see inside a building before deciding if it is worth a trip to view the property in person.

Web sites like Zillow and Trulia provide potential buyers and sellers detailed property information, estimates of the value of a home, historical pricing data, and a list of comparable properties on the market. Companies like Zip Realty, an online real estate brokerage, use self-service technology to lower their operating costs and then share the cost-savings with clients. By giving their clients unrestricted online access to the Multiple Listing Service

(MLS), relevant property information, and online tools to rate and review homes, prospective buyers can maximize the value of the time they spend with their agent. In return, after buying or selling a home, buyers receive a cash rebate equal to 20 percent of the real estate agent's commission and sellers pay a discounted commission to their broker. In addition, because homeowners now have access to the same information as real estate agents, some sellers forgo using an agent altogether, thereby allowing them to save the money it costs to pay a commission. To cater to these customers, Web sites such as ForSaleByOwner.com offer fee-for-service options to home buyers and sellers who would rather not use an agent at all. For example, sellers can pay a flat fee to list their property on the MLS, rather than paying a commission. Eighty-seven percent of those searching for a home in the United States use the Internet; as of 2008, 32 percent of home buyers first learned about the new home they purchased over the Internet.²³⁸

Consumers are even taking over the jobs of customer service representatives. For example, consumers can check online the progress of packages being handled by most major shipping companies.²³⁹ By going online and doing the work themselves, consumers can often save time and money and companies can charge lower prices overall. Likewise, airline passengers in many countries have grown accustomed to selecting online their own seats for airline flights.

The Internet also makes it possible for individuals to become active producers in the economy. The phenomenon of peer production is increasing rapidly as users generate and consume content from each other, blurring the lines between producers and consumers. Among blogs, social networks, YouTube videos, and wikis, users are creating substantial additions to the Internet.²⁴⁰ In Korea, OhmyNews relies on 33,000 volunteer reporters who submit articles to its staff of 35 who review and compile the articles into an online publication that has surged in recent years, even as more conventional media outlets have lost readership.²⁴¹ Similarly, CNN has launched iReport, an online service that empowers individuals to become citizen journalists and submit articles, photos, and video of news as it happens.

To be sure, the many benefits to empowered consumers might seem to be at the expense of accountants, attorneys, realtors, reporters, stockbrokers, travel agents, or others. And in some cases this is true. However, economies are not organized (or at least should not be) to preserve job security for certain professions, but rather to ensure that the overall population enjoys an increasing standard of living. And e-commerce is driving that growth. Moreover, in some cases e-commerce lets these jobs shift to more complex and valuable work. Many of these professionals, such as attorneys or insurance agents, are able to devote greater time to more complex matters where their expertise is more highly valued. For example, even as the public enjoys iReports at CNN's Web site, there remains value for news that is vetted, verified, and edited for accuracy. As this report explains, the dot-com economy has created new products

and services in a variety of fields, many of which require technical skill and raise the value of professional expertise.

Holding Organizations Accountable for Providing Quality Goods and Services

By giving consumers more information about goods and services, the Internet puts competitive pressure on organizations to boost quality. For example, eBay's seller rating system allows buyers to rate eBay sellers on the quality of the service, enabling future buyers to avoid sellers with low ratings and spurring sellers to provide good service. Before the Internet, an organization providing poor service or shoddy products might go relatively undetected, because it was difficult for affected consumers to communicate their displeasure beyond their immediate circle of family and friends. Moreover, organizations had very little capability to determine whether their customers were satisfied. Now organizations can use low-cost, online surveys to more easily tease out customer preferences. Better customer information can help a business catch a poor decision before it causes long-lasting damage and also help businesses tailor their services more closely to their customers' wants and needs.

What's more, the Web gives consumers the power to check many different sources to benchmark quality, from the on-time performance of airlines, to test scores in elementary schools, to the quality of physicians (ratemd.com), college professors (ratemyprofessor.com), and competing universities.²⁴² Now, when consumers are unhappy, they can let the whole world know. For example, when an AOL customer tried to cancel his service, he recorded a telephone conversation that revealed AOL's determination to retain customers.²⁴³ Audio of the exasperating incident was posted online and spread through blogs, leading AOL to alter its customer retention policies. Instances like these of customers actively informing businesses of their wants, needs, and qualms through the Internet will only increase going forward.

Expanding Consumer Choices

An economy that gives consumers more choices in products and services inherently provides more value to people than one that provides fewer choices for the simple reason that broader choices are more likely to better match the different interests and needs of more individuals.²⁴⁴ The Internet plays a central role in creating an economy that gives consumers vastly more choice. In the same way that a large supermarket gives shoppers a wide variety of products to choose from, the commercial Internet has reduced the costs of giving consumers more choices, creating the "long tail" effect described previously. As Chris Anderson convincingly documented in his book *The Long Tail: Why the Future of Business is Selling Less of More*, the Internet economy has created marketplaces where it is economical for even the most obscure goods to be sold.²⁴⁵

Moreover, the Web enables sellers and producers who might otherwise never be known to find an audience, and conversely makes it possible for consumers to find products or experiences they might otherwise never find. For example, Clap Your Hands

Say Yeah, a popular Indie band, has managed to sell over 100,000 copies of its self-released debut CD online without having a recording contract.²⁴⁶

THE INTERNET ECONOMY HELPS FIRMS AND WORKERS

The Internet economy not only helps consumers, it helps firms become more productive and profitable and helps workers earn higher wages and become more employable.

Boosting Productivity in Firms

Internet solutions help firms boost productivity and cut costs, thereby enabling them to cut prices and expand output. One way firms save money is that Internet solutions enable them to streamline their supply chain. Overall, the cost savings from global business use of e-commerce were estimated to have reached \$1.25 trillion by just the mid-2000s.²⁴⁷ (Global business-to-business e-commerce value was expected to have reached \$4.3 trillion by 2005.)²⁴⁸ Firms can achieve savings because e-business is significantly more efficient than regular transactions. For example, processing a purchase order manually costs 8 to 18 times what an online procurement costs.²⁴⁹ This is one reason why firms utilizing e-procurement enjoy 7 percent higher value-added (the value of output produced compared to the costs of inputs) than firms that do not.²⁵⁰ But even larger savings accrue to firms from creating Internet-enabled supply chains. The ability to track shipments online allows firms to better time production and to anticipate bottlenecks in supplies, while up-to-the-minute information about inventories tells suppliers when fresh deliveries are needed. Cisco Systems alone saves \$360 million per year through using the Internet for e-business.²⁵¹ IBM, with over \$91 billion dollars in annual revenue, was able to save \$6 billion dollars in 2005 by reengineering its supply chain processes, which included the automation of some processes through Web-based applications in addition to other process changes and consolidation of functions. IBM established an e-procurement system which substantially improved efficiencies, reducing the average contract cycle time from 6 to 12 months to less than 30 days. IBM also established an Internet-based tool for booking employee travel in 2004 that initially posted average monthly savings of \$2.5 million.

An array of studies document how the commercial Internet boosts firm productivity and profitability:

- One study, looking at the adoption of Internet-based business practices, found that between 1998 and 2001 firms in the United States saved \$155 billion, and by 2010 they are expected to cumulatively save \$528 billion.²⁵² The study estimated that the net impact of these cumulative cost savings is expected to account for 0.43 percentage points of the future increase in productivity growth.
- A review of 1,394 German firms found engaging in B2B e-commerce significantly increased both multifactor and labor productivity. The study found that firms that did not

use B2B e-commerce would increase their productivity if they used it. The authors stated, “Especially at the micro-level there is broad empirical evidence for positive impacts of ICT on labor productivity.”²⁵³

- In a study of firms in the EU, firms that had implemented eight e-business practices (including online sales and purchasing) were more than twice as likely to report that they had increased productivity in the last year, and they were approximately twice as likely to have expanded employment compared with firms that did not use Internet technologies to innovate.²⁵⁴
- In a study of 1,955 European firms, Nurmilaakso found that Internet access and standardized data exchange with trading partners contributed to significant increases in labor productivity.²⁵⁵
- A study of over 6,000 firms in New Zealand found that the adoption of broadband Internet service boosts productivity by approximately 10 percent across all firms, with an even greater increase for firms in rural areas.²⁵⁶
- Evidence from a U.S. manufacturing sample shows that the use of LANs, EDI, and the Internet by a manufacturing firm increases labor productivity by 5 percent.²⁵⁷
- A Finnish study found that granting an employee Internet access at work increases his productivity by 3 percent in the service sector.²⁵⁸
- Studies examining Swedish firms found that access to broadband Internet is associated with increases in productivity of 3.6 percent for manufacturing and services firms²⁵⁹ and 62 percent for ICT firms.²⁶⁰
- A study of the U.S. wholesale automobile industry found that adoption of B2B electronic commerce cut the costs of selling cars by 5 percent of the value of the automobile and 80 percent of the transaction cost.²⁶¹
- Another study found that 34 percent of U.S. and 29 percent of Danish small manufacturers surveyed indicated that their competitive position was strengthened a great deal by doing business online.²⁶²
- A study of 253 small firms in Spain found that e-business solutions increased organizational performance by expanding industry learning and organizational efficiency.²⁶³
- A study of 1,666 SMEs in the United States, Canada, the United Kingdom, France, and Germany found that small firms adopting Internet business solutions enjoyed an increase in revenue of approximately 9 percent.²⁶⁴ In addition, firms in the United States and Canada enjoyed decreased costs of goods sold by approximately 7 percent (European firms had lower decreases). Moreover, customer-focused Internet business solutions (e.g., e-commerce, e-marketing, etc.) were ranked as the primary drivers of increased revenues and reduced costs. As the authors conclude, “Our data show clearly that the adoption of Internet business solutions by SMEs in Europe and North America leads to tangible benefits.”²⁶⁵

Internet-enabled firms are also able to pay higher wages:

- One study examined the relationship between business use of advanced Internet technology and U.S. wage growth between 1995 and 2000 and found that business use of advanced Internet technology is associated with wage growth.²⁶⁶
- A study of farm households in Taiwan found that Internet use improves farm household income.²⁶⁷
- A study of Internet users in the United States found that use of the Internet is associated with higher wage growth, in part because it imparts higher skill levels.²⁶⁸

Box 1: Nicholas Carr Was Wrong: IT Does Matter

Because so many product and service markets are highly competitive, most of the benefits of the dot-com economy usually flow through to consumers in the form of lower prices, higher quality products, and better service. This process is what Nicholas Carr was referring to when he claimed that “IT doesn’t matter.”²⁶⁹ Carr acknowledged that IT mattered a great deal to the economy, but argued that since all firms have to use IT (not using it consigns them to a significant competitive disadvantage), it fails to give firms a distinctive advantage that they can use to achieve higher returns, especially over the longer term as the adoption of these technologies becomes ubiquitous. However, there is considerable evidence that IT matters not just to the entire economy, but to individual firms as well. The evidence suggests that Internet-enabled business practices not only lower prices (helping consumers and the economy) but also boost returns. Efendi, Kinney, and Smith found that firms adopting B2B procurement systems increased average return on assets by nearly 3 percentage points and raised their average profit margin by 2.7 percentage points relative to a matched set of non-adopting businesses.²⁷⁰ Likewise, a comprehensive study of over 1,100 large U.S. firms conducted by one of the leading observers of IT and business, MIT Professor Erik Brynjolfsson, found that firms with higher profit rates were those that generally adopted what Brynjolfsson calls digital business practices (the adoption of IT and business practices that take advantage of them). In addition, as the authors of one study on the benefits of adoption of Internet-enabled business practices stated, “From our analysis, we can conclude that Carr got it wrong... IT does matter.”²⁷¹ One reason why Carr got it wrong is that with Moore’s law and continued innovation in IT, including in applications, IT technology is continually improving. Firms that stay on the leading edge of applying it can gain sustained advantage over their competitors that lag behind.

Giving Small Business Access to Larger Markets

Not long ago, businesses and consumers in big cities had considerable advantages over those in rural areas. Specialty stores could thrive with concentrated populations of diverse tastes. The Internet has changed this dynamic. Taking a business online gives companies a potential customer base 20 to 30 times larger than those enjoyed by stores in even the largest metropolitan areas.²⁷² As a result, consumers who live in smaller metropolitan areas or rural areas and who were previously constricted in their choice of products and services now have the same kinds of consumer options as someone living in Manhattan. As long as they have broadband Internet access, ranchers in the middle of Wyoming have the same selection of music and books through iTunes or Amazon as anyone in New York City. Even services once thought to be non-tradable, or impossible to export beyond immediate markets, such as health care and college education, are increasingly traded over the Internet and can reach even the most remote areas. Farm households are more likely to purchase a greater percentage of non-durable goods (e.g., books, clothes, etc.) through the Internet the farther away from urban markets they are.²⁷³

Firms utilizing e-procurement enjoy 7 percent higher value-added than firms that do not, in part because processing a purchase order manually costs 8 to 18 times what an online procurement costs.

While the Internet has assisted many small businesses in realizing efficiencies and accessing new customers, it is also true that some e-commerce developments have led to small businesses losing market share. Since e-commerce gives consumers access to businesses around the world, not just in their local neighborhood, consumers may elect to purchase books from Amazon instead of a local bookstore or develop vacation packages online instead of through the local travel agent. Overall, the result has been lower prices and increased convenience for consumers, although this has contributed to some degree to fewer small firms selling books and travel services.²⁷⁴

Nevertheless, the Internet has enabled many small businesses to gain access to new markets, especially those businesses providing a unique product or service. A major reason for the ability of these small firms to thrive through e-business is that the Internet enables them to more easily access markets beyond their local area. This is particularly important for rural small businesses. Indeed, in what has been termed “Internetization,” the Internet gives firms access to customers around the world, as a number of studies have demonstrated. For example, Becky Collins, known as “Granny B,” runs a successful business selling homemade pillowcase dresses from her rural hometown of Homer, Louisiana. With the help of her Web site, Collins is now a full-time entrepreneur, demonstrating the potential of e-commerce with the help of broadband Internet.²⁷⁵

One study of firms in Australia found that the “Internet has a positive influence on international information, knowledge, entrepreneurship, and networks and these in turn influence international market growth.”²⁷⁶ Likewise, a study of 438 Canadian SMEs in manufacturing found that those that are active in international markets are more inclined to conduct business electronically and make more extensive use of e-commerce than SMEs that are active only in local markets.²⁷⁷ In particular, the study found that firms using e-commerce to support their international sales and marketing activities are likely to also use it to support their international procurement activities. These impacts appear to be widespread in many nations. One study that analyzed the impact of Internet penetration rates in 66 developing countries found that a 1 percent increase in the number of Internet users is associated with a 4.3 percent increase in exports.²⁷⁸ E-business solutions also let firms more easily establish better relationships with suppliers, partners, and customers, regardless of where they are located. A study by Trimi, Faja, and Rhee found that the use of Internet-enabled solutions increased the frequency of new partnerships, improving the quality of relationships with existing partners and increasing partnership performance amongst 206 small U.S. firms.²⁷⁹

But the benefits of Internet-enabled business solutions are not confined to developed nations. Small businesses in developing nations benefit too. Sellers in developing countries can use the Internet to get access to market information that enables them to gain better terms of trade with wholesalers and other intermediaries and to make better decisions about what and when to produce. In 2001, for example, the villages and local governments of the Dhar district in central India joined together to fund the Gyandoot project to build a low-cost rural Intranet joining 20 village information kiosks.²⁸⁰ This project enabled villagers in the district to share information and access the Internet using dial-up connectivity through local exchanges on optical fiber or ultra high-frequency radio links.²⁸¹ Farmers using the service went online and found a distant village that was willing to pay more for their potatoes than the local rate. As a result, the Gyandoot project has increased prices paid to village farmers by 3 percent to 5 percent and has saved the farmers from having to pay commissions to middlemen.²⁸²

The Indian Tea Board, the body responsible for the world’s largest tea market, has created a similar initiative to use IT and the Internet to facilitate tea “spot trading.” Tea has been traded in India since 1861 at the Tea Auction Center in Assam, where transactions were brokered in person and recorded on paper. In 2008, the tea markets went digital. The move to computerized tea auctions now allows buyers to bid from anywhere in the world. Studies in other commodity markets have shown that even modest reductions in transaction costs through automation can produce large increases in trading volume. The hope is that computerized spot trading will result in more efficient services and fairer prices for India’s tea farmers.²⁸³ Several studies have analyzed the effect of the Internet and IT on the efficiency of micro-businesses in the developing world, with one study

finding that IT has substantial effects on Indian micro-firms by eliminating intermediaries between small firms and their customers, cutting prohibitively high transaction costs.²⁸⁴

Boosting Innovation

Innovation is the introduction of new products, services, and business models to the market. Innovation requires creativity, inspiration, and information. Knowing what users want, knowing what their needs are, and knowing how to develop new products and services is essential for innovation. The Internet helps with all of this. In the European Union, about one-quarter of firms surveyed state that the Internet enabled them to introduce new products or process technologies.²⁸⁵ This included activities such as selling and purchasing online and engaging in e-learning. Moreover, Internet-enabled innovations boost firm sales and employment.

Increasingly companies are, in the words of MIT Professor Eric Von Hippel, “Democratizing Innovation.”²⁸⁶ Firms use the Internet to allow customers, partners, and third parties to co-create alongside them, helping them to design and develop new innovations. For example, kite surfing advocates created and now participate in a Web site that has turned into a major site for innovation in the field.²⁸⁷ Dell launched its IdeaStorm Web site in 2007 to more easily solicit ideas and suggestions from its customers that could be integrated into the product development lifecycle. Using this Web site as a virtual suggestion box, online users can submit their feedback and vote for the best ideas. In turn, Dell tracks which ideas are submitted, reviewed, and implemented and provides more transparency to its customers on its initiatives and business decisions.

The Web is even being used to help companies solve complex technical problems. Perhaps the best examples of this are NineSigma.com and InnoCentive.com, which have created online portals in which problems posed by business are outsourced to the general community for a reward.²⁸⁸ Over 200,000 “solvers” from 175 countries participate in InnoCentive’s network. So far the largest reward for a solution is \$1,000,000 and solutions have come from as far away as Russia, India, and China. One study of the economic impact to a corporation using InnoCentive challenges found it receiving a return on investment of 74 percent with a payback period of less than three months.²⁸⁹ As another example, IBM leverages the Web to organize what it calls “Innovation Jams” to brainstorm new ideas. Held over a 90-hour period from October 5th to 9th 2008, IBM’s 2008 Innovation Jam saw over 90,000 individuals from more than 1,000 companies across 20 industries make 32,000 posts.²⁹⁰ Working closely with leaders from the participating Jam companies, IBM distills the thinking into a core set of the most promising ideas.

The Internet also helps organizations better manage the existing knowledge of their employees. For example, one specialty chemical company made over 2,400 technical case histories available for its employees worldwide to access.²⁹¹ Prior to the Web, it could take weeks for employees in dispersed divisions

to find answers from experts in their own organization. But putting knowledge management systems online has changed that. For example, oil well equipment company Schlumberger used an online knowledge management system that reduced by 95 percent the time involved in resolving technical queries.

The Internet further facilitates innovation because it enables companies with new products and services to more easily find markets for them. In the old economy, firms that developed new products or services had to launch expensive marketing campaigns in order to make consumers aware of them, or had to work hard to get existing retailers to stock the new product. Now with the Internet and e-commerce, firms have an easier time introducing new products and services. Indeed, a study by Prince and Simon found that the Internet helps bolster demand for products early in their diffusion process, and that improved access to information and the convenience of online shopping are likely the primary drivers of this effect.²⁹²

The Internet isn’t just about enabling high-tech innovation. One site, AfriGadget.com, is dedicated to showcasing African ingenuity. A team of bloggers and readers contribute their pictures, videos, and stories from around the continent. The stories of innovation are inspiring. They showcase simple, sustainable inventions in Africa, ranging from efforts to create biodiesel fuel out of local pine nuts in Sierra Leone, to programs to build bicycles out of bamboo in Ghana and Kenya, to low-cost parabolic solar reflectors in Somalia.

Use of the Internet in the United States is associated with higher wage growth, in part because it imparts higher skill levels.

More Efficient Labor Markets

With average employment tenure lower than it was two decades ago, workers face more risk of losing their jobs, even when the economy is not in recession. In the old economy unemployed workers searched for jobs through means including social networks, employment agencies, and newspaper help wanted ads. But with the arrival of the Internet, Web sites such as CareerBuilder.com and Monster.com enable superior matching between employers and employees, making the process cheaper and faster and providing both employers and employees with more information on which to base their decisions. More than two-thirds of U.S. job seekers now search for jobs online, and the relatively low cost of finding and screening applicants means that higher quality matches are possible (which raises labor productivity as well).²⁹³ A November 2006 study by the Conference Board, an economic research organization, found that 38 percent of job seekers who received offers felt that their job offer originated from their Internet search.²⁹⁴ Workers who use the Internet for employment search are 15 percent more likely than non-users to have moved to a new job within a month, further suggesting that online searching leads to better job

matching.²⁹⁵ The Internet can also provide better opportunities for particular kinds of workers. In one study of highly skilled immigrants to Canada, researchers found that by using the Internet (instead of social networks or employment agencies) immigrants received better signals about the job market while also sending better signals to potential employers, thus enabling them to find more and better opportunities to get good jobs.²⁹⁶

The Internet has also been central to the emergence of telework as a viable option for many jobs. Using dot-com technology including Web mail, video conferencing, and other Internet applications, more workers are able to work from home or satellite offices.²⁹⁷ This enables employers to offer more flexible work arrangements and helps retain talented workers. For example, doctors can take calls from patients and use a Web site to submit an e-prescription. Companies like JetBlue have eliminated call center locations entirely by replacing them with work-from-home staff connected via the Internet to JetBlue's central reservations system.

The Internet enables more efficient allocation for a wide variety of products and services, helping to maximize the economy's allocative efficiency by distributing products, services, and skills to the parties that value them most highly.

The Internet also enables businesses to more easily take advantage of larger and more competitive labor markets. For example, by using the Web sites CrowdSpring.com or Freelance.com a business can advertise a creative project and then choose the best submission to their project from designers all over the world. The availability of low-cost, high-quality online communication and project management tools makes it easy for workers to collaborate with other teammates located anywhere in the world.

Not only has the digital economy enabled more people to work in the paid, market economy, it has enabled more people to contribute through volunteer efforts, which help the economy grow by expanding overall economic output. In the wake of Robert Putnam's 2000 book, *Bowling Alone*, there has been considerable concern that Americans are participating less in civic activities. Yet, while perhaps not making up for the loss of face-to-face volunteering, the Web, particularly since the emergence of the more social Web 2.0, has made it easier for people to volunteer online and to find volunteer opportunities in their community. One study estimates that between 10 and 15 million people worldwide participate in online volunteer communities, ranging from online volunteer technical support groups (more than 50,000 of them) that win industry awards for their quality support, to volunteer mentoring and tutoring programs that give career advice and even provide matching services between individuals considering a field and experts already in it.²⁹⁸

The Internet can also play a particularly important role in helping retirees plug into volunteer opportunities. As baby boomers retire in droves, tapping into their talents will help ease the loss to the economy their retirements would otherwise bring. Sites such as Dinosaur-exchange.com are springing up to connect retired professionals who are not content to spend the next couple decades playing shuffleboard with potential employers desperate for expertise.²⁹⁹ YourEncore.com connects the technology and product development opportunities of member companies with the talents of retired scientists and engineers.³⁰⁰ Instead of bringing in untested outside talent, retirees serve as a safe and flexible workforce and these sites keep that pool of talented workers in close contact with potentially undermanned companies in case a contract or salary position is needed on relatively short notice.

More Efficient Allocation of Goods and Services

The Internet enables more efficient allocation for a wide variety of products and services, helping to maximize the economy's allocative efficiency by distributing products, services, and skills to the parties that value them most highly. For example, the Internet has spurred creation of auction and matching markets for everything from personal memorabilia to commodities markets to professional skills. The Internet also allows money to be allocated more efficiently. By speeding transactions, e-payments reduce the need for companies to hold working capital caused by the delay in processing checks, so that more economic activity can be associated with the same money supply.³⁰¹

At the consumer level, online companies like Craigslist enable markets for things like apartment rentals to operate more efficiently. Originating in San Francisco, Craigslist allows users to post classifieds for everything from apartments to jobs to personals at greatly reduced prices relative to conventional means. Not only does Craigslist save listers money, it causes a significant reduction in the apartment and housing rental vacancy rates because it does a better job of linking renters with landlords.³⁰²

The Internet also makes it easier for organizations and individuals to participate in markets, particularly by linking individuals with products that others may not find of much value. There is no better example of this than eBay. For those sellers who use eBay to sell used goods, this does not lead to more production, but it does lead to more value because it enables items to be reallocated from individuals or businesses who value them less to individuals and businesses who value them more. What once might have been thrown out (or stored in an attic) in the old economy is now used and provides value to someone else in the new economy. Likewise, services like Amazon.com's used book service make it just as easy to buy a used book as a new book and to find out-of-print books, better allocating books that otherwise would have been thrown away or left in an attic. Without the Internet, this kind of reallocation was confined to weekend swap meets, garage sales, or other haphazard and time consuming exchange mechanisms.

The Internet doesn't just enable workers to be more productive, it also lets organizations use capital equipment and natural resources more efficiently (as the trucking industry's use of the Internet, described previously, illustrates.) In any organization capital is a scarce resource, and its more efficient use frees up that capital for more effective uses elsewhere in the organization or in the economy as a whole. But capital equipment only contributes to output if it is used, and in many organizations equipment is underutilized. By helping to match demand and supply, the Internet can play a key role in enabling organizations to increase utilization rates of capital equipment.

Likewise, the Internet lets airlines better schedule flights and raise seat utilization, allowing them to operate fewer flights, saving fuel and money. This is particularly important in ensuring that scheduled departures are as full as possible; airlines receive no revenue from empty seats. Now airlines can advertise and sell e-fares online one or two weeks before a flight departs, filling up otherwise under-booked flights with customers willing to fly with flexible schedules and pay lower prices.

Many of the benefits of the commercial Internet remain under-reported; for example, the total value that consumers get from Internet searches is not counted in any official output statistics.

THE DIRECT CONTRIBUTION OF THE INTERNET INDUSTRY TO THE ECONOMY

While the lion's share of the value of the commercial Internet lies in the social and economic benefits it confers to the global economy, the Internet itself constitutes a noticeable component of the U.S. economy. Defining and measuring the value of the Internet industry itself is not easy, as there is no clear, agreed-upon definition, and data availability is limited. However, there are some estimates.

Globally, the OECD estimates that of the top 250 ICT firms in terms of revenue, Internet firms accounted for \$18.3 billion in revenue in 2000, growing to \$56 billion in revenue in 2006, with employment growing from 47,539 to 93,380 over that time period.³⁰³ However, these numbers significantly undercount total employment, as they only count employment in Internet firms and not in firms that provide Internet services as part of their overall business (e.g., Microsoft) or in firms that use the Internet (e.g., the jobs of those managing Web sites or Web services for corporations). Globally, the Internet industry is still an American-dominated one. Of the top ten Internet firms in terms of revenue, nine are American, with one being an affiliate of a U.S. company (Yahoo! Japan). The largest dot-com firm in terms of employment is Amazon, while the largest in terms of revenue is Google.³⁰⁴

Within the United States, using a broader definition of Internet employment, a study commissioned by the Interactive Advertising

Bureau found that 1.2 million Americans are employed directly to conduct Internet advertising and commerce, build and maintain the Internet infrastructure, and facilitate its use. Each Internet job supports approximately 1.54 additional jobs elsewhere in the economy, for a total of 3.05 million jobs, or roughly 2 percent of employed Americans. The dollar value of their wages totals approximately \$300 billion, or around 2 percent of U.S. GDP.³⁰⁵

Given that many Web sites are free to visit, one of the key sources of revenue to the Internet industry is advertising revenue. While globally television and newspaper advertising still dominates, Internet advertising has been growing the fastest as a share of advertising, increasing from around 5 percent of all advertising in 2005, to almost 10 percent in 2009, with almost all of that share coming at the expense of newspapers and magazines.³⁰⁶ In 2007, overall global online advertising was estimated at \$31 billion. The nations that lead in online advertising as a share of total advertising are the United Kingdom, Norway, Sweden, and Korea, with levels of more than 10 percent of total advertising expenditures.³⁰⁷ Within the United States, Internet advertising amounts to \$20 billion in revenue.³⁰⁸

Finally, dot-com domain names themselves often have significant value. At first, many companies were slow to realize this, which often allowed individuals to buy up what they thought would be valuable domain names and later sell them to companies at considerable profit. In fact, as late as 1994 only one-third of the Fortune 500 had registered an obvious version of their domain name online.³⁰⁹ For example, in 1994 cbs.com was registered to a consultant in Golden Valley, Minnesota. Only later did CBS determine that it really needed to own this domain name. Consequently, some domains have sold for considerable sums of money. The dot-com domain name that sold for the most money is Fund.com, a site that helps users find mutual funds, which was purchased for almost \$10 million (\$9,999,950). In fact, at least 40 dot-com names have been purchased for prices of at least \$1.5 million.³¹⁰

THE SOCIETAL BENEFITS OF THE INTERNET ECONOMY



Doctor accessing patient's electronic health record

While the Internet economy has and continues to transform business and the economy, it is also transforming society and individual life. In fact, the Internet has been a key enabler of many of today's key innovations and improvements in our lives and society—from better education and health care, to a cleaner and more energy-efficient environment, to safer and more secure communities and nations.

EXPANDING INFORMATION AVAILABILITY AND ACCESS

One of the most important impacts of the commercial Internet is making individuals' access to information more convenient and efficient. The Internet contains all kinds of information that touch every part of modern life. New technologies are making all that information easier to find and verify while also expanding the opportunities to interact with, contribute to, and view all sorts of information.

Growth of Information Online

Throughout the 20th century, most information was passively received through TV, radio, newspapers, and magazines. Finding information meant searching through whatever books sat on a bookshelf or in the local library. These traditional publishing paradigms restricted the creation of new information sources and access to information. But the paradigm has shifted dramatically over the last 20 years as books have given way to Web sites and new sources of information have flooded the Internet.

With a few strokes on a computer keyboard, Internet users can learn about a foreign destination they wish to travel to, find reviews about local restaurants, or discover the best neighborhood bicycle routes. Indeed, while it is hard to imagine

living without the Internet now, not too long ago if one wanted to learn about Mozart, driving to the local library was often the only option. Now with search engines like Google and online encyclopedias like Wikipedia, volumes on virtually any subject are but a click away. In education, students are no longer limited by the walls of a library or the expertise of a single teacher because they can access resources from a global classroom and connect with both fellow learners and subject matter experts, regardless of geographic proximity. In health care, patients can study their conditions using the same materials as their doctors, share insights with people suffering from similar maladies, and get additional opinions on how to proceed with various treatments. The impact of the Internet on improving individuals' lives through improving their access to information has been profound, making daily activities more efficient and robust.

One of the most striking aspects of the IT revolution is how it enables new sources of information to be created by lowering the barriers of publishing to allow anyone to contribute to the Internet's collective knowledge base. Blogs have become platforms for individuals to have their voices heard. Though some blogs do not deal with matters of substance, many are being written by subject matter experts, be they professional or amateur, sharing their insights on trends, commenting on news, and providing free analysis and new perspectives that previously might never

have found the light of day. Blogs provide an opportunity to find the unfiltered opinions of people around the world, from consumers to innovators, and they are now often being used by industry as well to announce new products, services, and hires in a less structured and often more informative way than a press release.

Tapping the collective wisdom of the crowd to compile more comprehensive sources of information is the defining characteristic of a “wiki,” a Web site that allows users to contribute by adding or modifying content. The most prominent example is Wikipedia.org, an online encyclopedia created and updated by its users. But wikis are also increasingly being used inside corporations, schools, and government agencies in order to create a public or private knowledge base to help the organization run more efficiently. A number of sites have sprung up that allow anyone to pose questions to subject matter experts and receive specific answers. One such site is AllExperts.com, which features a host of volunteer experts ready to answer questions on topics ranging from how to create great animation to computational biology to tips for dealing with chronic pain. Simply select an expert, pose a question, and receive an answer. Combining the ability to ask questions of experts with the power of the collective consciousness are sites like Yahoo! Answers, where questions can be posed to an open, global audience of potential experts. Anyone can answer and anyone reading the question can weigh in on which answer is their favorite, helping a user determine which answers to trust. User input helps direct people to new information and engage in better decision making. User reviews help online shoppers decide which product to buy and which merchant to trust. Home chefs can search through online recipes and choose dishes with the best ratings and find the most useful tips. Users can even go online to Zeer.com to find the nutritional labels of a wide array of foods and to see how other users have rated the food.

Another tool that helps users automatically receive content is RSS, short for Really Simple Syndication. Using RSS, users can subscribe to a Web site and receive updates when new information is posted on that site. Subscribing to an RSS feed is like subscribing to get a magazine delivered to the home rather than having to go to the store to buy it. RSS readers also allow users to create custom searches that will alert the user when it finds new content that matches their interests. In this way, users can have relevant information find them rather than them having to go out and find it. Businesses use this same model to create a digital memo system that automatically notifies relevant parties when information such as company policy changes. RSS is not limited to Web pages because it can also be used to enable multimedia feeds. The most common type of multimedia feeds are podcasts, which are typically recorded Internet radio shows. Users can download podcasts on thousands of topics—from learning to speak a foreign language to university lectures to congressional hearings. Users can even set up a program like iTunes not only to download podcasts automatically but also to synchronize them with a portable media player, meaning the content is ready for them to listen to within moments of

becoming available. Although podcasting got off to a slow start, from June 2007 to March 2008 the percentage of global Internet users who downloaded podcasts more than doubled, from just over 20 percent to 45 percent.³¹¹

The Internet doesn't just provide information in the form of words; it increasingly serves as a source of information about places and geography. Thanks to the Internet, a vast amount of information is available to anyone contemplating a trip of any length from a walk to the corner store (is it open at this hour?), to a drive or bus trip across town (how is traffic?) or across the country (how far is it and what is the shortest, or most scenic, or least congested route?). Want to know what a road in Yosemite National Park looks like? MapJack.com will let you see it. Want to see what a view of a particular street is? Google Street View or Microsoft's Live Search Maps will show you. Want to find the best place for your next run and how many miles it is? Mapmyrun.com, can help you find out. Want to find the location of a restaurant? Individuals can go to Google Maps, MapQuest, or other online mapping systems and type in a specific location and the mapping application will then find and identify services (e.g., gas stations, restaurants, hotels) nearby.

The Internet has enabled the growth of over 100,000 new organizations focused on social issues.

Increasingly this kind of information is available in real time. Checking the status of a flight to see if it is on time or has been canceled is easily accomplished by mobile phone or Web browser. Both Google and Microsoft now have systems announced or already available that provide traffic information in real time. Google Maps provides a “traffic” button on its maps in metropolitan areas that shows red-yellow-green indicators for traffic speeds. And Google recently introduced a feature that reports “normal” traffic levels by the time of day or day of the week. Microsoft has announced a new software feature called Clearflow that uses artificial intelligence to provide navigation advice that takes into account expected traffic conditions on a roadway-by-roadway basis.³¹²

The Internet has created a paradigm shift that benefits people with disabilities. Information is no longer constrained to a single medium. Instead, IT has created a world where users can choose the format in which they want to access information. Twenty years ago, for example, only a paper copy of the *New York Times* was available. Now individuals can choose to read the newspaper in print, online, or on a cell phone or other mobile device. Visually impaired subscribers can use text-to-voice applications to hear the newspaper and subscribe to podcasts from leading *New York Times* columnists.

Increasing Access to Health Information

Ever since Hippocrates developed an oath for doctors, the model of health care has been one where the doctor had the information and the patient received it. But this model was always flawed

because it failed to make patients active participants in their care and treatment. One reason that some individuals are not more actively involved in managing their own health and health care is that they have bought into the idea of the doctor as the expert, believing that “the doctor always knows best.” (Also, many have reported that doctors may berate them for inquiring about a remedy or trying to become a more active participant.) Now the Internet is fostering a radical transformation of health care by enabling patients to become much more empowered, both about the kinds of treatments that are available to them and about the quality of the health care providers they choose. By providing patients with access to more and better information, the Internet empowers them to make more informed health care decisions. By increasing patients’ access to their own medical records and to a plethora of information to help patients make better decisions, the Internet has the potential to improve health care.

When patients have access to their personal medical records, they can take a more active role in their health care and routinely monitor their symptoms and treatment. Access to personal health records helps give patients a stronger sense that they have control of and responsibility for their own care. Many dot-com applications, including WebMD.com, revolutionhealth.com, health.com, and Microsoft’s healthvault.com, have emerged to allow individuals to track and analyze their personal health information. With online access to their personal health records and new Web-based tools, individuals can manage their health information online as easily as they manage their finances. Currently, for example, online applications allow patients to track health markers such as their blood pressure, cholesterol, and body mass index to see how these indicators change over time and how they compare to healthy patients of the same age and sex. Patients can combine these online tools with medical home monitoring devices to track and compare their health between office visits.

Consumer demand for electronic health records (EHRs) and personal health records is growing, and many people have embraced the technology when it is available. One leading EHR software company reports that its product is used by more than 58 million people, mostly in large multispecialty practices.³¹³ The global leaders in the adoption and use of EHR systems by primary care physicians are Sweden, Finland, the Netherlands, and Denmark, where EHRs are used, respectively, by 100 percent, 99 percent, 98 percent, and 95 percent of primary care physicians. Two other countries leading the adoption of EHR systems by primary care physicians include New Zealand and the United Kingdom, with both posting EHR adoption rates among primary care physicians of close to 90 percent.³¹⁴ In the United States, Kaiser Permanente, the largest not-for-profit health plan in the country, has implemented an EHR system, healthconnectsystems.com, which allows patients and providers instant access to their medical information. Physicians use the system to place orders, review laboratory results, and access their patients’ medical histories. Health plan members access the information using a secure Web portal that allows

them to review laboratory results and office visits, as well as to communicate with their providers. As of mid-2007, 1.4 million Kaiser Permanente members had signed up for online access.³¹⁵ Kaiser Permanente has also partnered with Microsoft to allow its members to voluntarily manage their personal health records using Microsoft HealthVault.

Some health systems that have introduced EHRs have found that they help reduce health care costs associated with visits to physicians. One study found that after introducing EHRs, Kaiser Permanente reduced visits to primary and specialist outpatient care by 5 to 9 percent.³¹⁶ Another study found that annual adult primary care visits decreased between 7 to 10 percent among patients who communicated with their providers electronically.³¹⁷ Secure Web portals also automate and simplify many health care transactions for the patient, including booking doctors’ appointments, making copayments, filing for insurance reimbursements, and ordering prescription refills. In addition to EHRs and personal health records, other online tools also increase access to health information. Today, patients use health resources on the Internet to learn more about medical conditions, treatments, and prevention. Indeed, a survey in 2005 found that 80 percent of U.S. Internet users have searched for health information online.³¹⁸ Online health resources eliminate barriers to information by giving patients more convenience and privacy, access to online social networks, and the ability to communicate with specialists around the world.

Online Education

Given the vast array of information Web sites enable, it is not surprising that the Internet has led to an explosion of online learning. Flexible online classes give people access to education in ways that would never have been possible before the Internet arrived.

These applications can start from the earliest years of life. Fisher-Price, for example, makes online games for babies and toddlers available for free, including games that help toddlers learn letters, numbers, names of animals, sounds of musical instruments, and other things.³¹⁹ Web sites such as FunBrain.com offer children online games and activities that reinforce skills and subjects taught in schools. Other online resources, such as Enchanted Learning, use multimedia to engage children’s creativity to teach about nursery rhymes, inventors, music, and other subjects. TumbleReadables.com provides a series of online books that allow children to read along with the story and get help with words that are difficult for them.

Educators can find many useful resources on the Internet too. The Web site Curriki, for example, provides a platform for educators to design and share curricula that benefit students and teachers around the world. Similarly, Web sites like TeachingBooks.net provide teachers and parents learning guides and activities for popular children’s books as well as online videos of authors and illustrators of children’s books to encourage children to read.

Companies are also using the Internet to help train their employees. Among a sample of Fortune 500 companies and large public sector organizations, technology was used to deliver 37 percent of formal training in 2005, up from 24 percent in 2003.³²⁰ For example, IBM's "Basic Blue" manager training program couples Web modules and simulation management exercises with classroom learning to achieve impressive efficiency gains: Studies have shown that the program costs one-third as much as a traditional classroom approach and managers learn five times the amount of material.³²¹ Recently, firms have begun to embrace a variety of new tools, including those that allow for peer-to-peer learning among coworkers. Indeed, blogs, wikis, podcasts, and collaborative software are becoming important tools for employees to exchange ideas and share insights.³²² IBM's WikiCentral, for example, has grown to include more than 12,000 users since its launch in 2005.³²³ Though the initial expense to establish online learning programs can be high, companies save over time on course materials, employee travel, and instructor fees. As a result, the savings for online programs generally add up to about 50 percent.

By allowing the widespread production, transmission, and consumption of virtual products—replacing bits for atoms—the Internet is paving the way to a more sustainable society.

IT is also reshaping how adults outside of organizations learn. The growing phenomenon of online learning is one of the more important ways that technology is reinventing education. In online classes, educators deliver lectures or other educational content via Internet video or podcasts, which students with a broadband connection can often experience at a time of their own choosing. Some classes even take advantage of messaging software to incorporate discussions, either as asynchronous posts or real-time discussion forums or chat rooms. And with the proliferation of institutions like the University of Phoenix, online learning is growing rapidly. In fact, more than 3.2 million students took online higher education courses in the fall of 2005—an increase of 35 percent over the previous year.³²⁴ Online education has become popular for a variety of reasons. A major reason is that it powerfully expands educational opportunities for people who may be physically unable to attend an educational institution because they are busy with work or children, are disabled or incarcerated, or live in a rural area where the courses they want to take are unavailable.

Distance education is moving in a direction that allows for greater interaction with other students. New online social software from companies like Writeboard.com and InstaColl.com allows students to engage in virtual collaboration on group projects for which they can collectively write and revise documents over the Internet. Similarly, online classes are increasingly taking advantage of blogs, wikis, podcasts, and streaming media to increase collaboration and interaction between students.³²⁵ Even in-person classrooms are using these tools. For example,

Blackboard Inc. empowers collaboration among students and professors between class meetings.

Finally, online learning is not limited to the content available in formal classes. The Internet puts an unprecedented amount of information at everyone's fingertips. With an Internet connection and a healthy dose of self-motivation, anyone can learn about a range of topics. These include topics related to activities of daily living—for example, it takes only a few clicks to find a Web video demonstrating how one can reset a Palm Treo smartphone (of particular use to visual learners who might have trouble with owner's manuals). Users wanting to find a wealth of "how-to" videos can go to Howcast.com to find everything from videos explaining how to make nachos to how to explain American football to foreigners. The Internet also includes more academic learning opportunities such as "iTunes-U," Apple's clearinghouse for free lecture podcasts from leading universities.

Building Community

The Internet has shepherded in a new era of online communities that supplement those found in the physical world. The Internet enhances existing communities and fosters civic activity by bringing people together and allowing them to stay connected.³²⁶

One way dot-coms do this is by creating new ways for individuals to find each other. Web sites such as Facebook.com and Classmates.com help reconnect old friends, helping people stay connected regardless of geography. For example, one study of 100 Facebook users found that only one was not "friends" with an international user, and as a group, study participants had over 1,500 foreign friends from all seven continents. Parents join Web sites to find others in their neighborhood who can share their experience with local doctors, schools, and job issues. Homeowners' associations can use services from LifeAt.com to create an online social network Web site for individuals living in their residential community. Using the LifeAt.com Web site, for example, neighbors can meet, organize activities, and showcase the community to potential buyers and rate neighborhood businesses. In addition, Web sites such as craigslist—the Internet's largest listing of local classified ads, job postings, personal ads, events and other announcements—provide custom portals for cities around the world that help residents find anything from a dog to a date. Many Web sites blend social networking features with another purpose. The Web sites Yelp.com and InsiderPages.com, for example, allow Internet users to rate local businesses and find others who share their opinion. The investments that people make in these online interactions yield positive benefits by creating a more connected and aware community.

Another way the Internet helps build communities is through online dating. In the United States, over 16 million people (or 11 percent of Internet-using adults) have visited an online dating Web site.³²⁷ Web sites such as Match.com or Yahoo! Personals allow millions of Internet users to search through profiles of other users looking to date. Many specialized dating services have also cropped up that target an interest such as politics,

the environment or sports, or a specific demographic, such as JDate.com for Jewish singles or PlanetEarthSingles.com for eco-friendly daters. Online dating Web sites allow users to search for the person who best fits their criteria to find the perfect mate rather than waiting for a chance encounter, and many singles use these Web sites for their efficiency. Looking for a more canine-oriented love? Petfinder.com lets users select from more than a quarter of a million animals, searchable by age, location, and gender.

Over 150,000 videos, totaling more than 30,000 hours of footage, are posted to YouTube each day, with YouTube now streaming 1.2 billion videos a day worldwide.

Tools to better manage the growing number of relationships of Internet users are also made possible by the Internet. Want to throw a party? Use sites like Evite.com and Mobaganda.com to send invitations and keep track of replies online. To keep track of people online, social networking Web sites such as Facebook.com and MySpace.com allow users to share personal information about their lives, develop new relationships with others, and stay current on the activities of their friends. Other networking tools such as LinkedIn.com give users the opportunity to network online and expand their professional network using their existing connections. Social networking tools can have a substantial impact on users. Researchers have found that individuals use social networking, e-mail, and other forms of Web-based communication to build, maintain, and enhance relationships and grow their social capital. Individuals then use this social capital when they need assistance, such as finding a job or getting financial advice.³²⁸

An additional community benefit made possible by using Internet-enabled social networking tools is the expanded availability of social (or peer-to-peer) lending. Social lending allows individuals to go outside of traditional lending institutions and borrow money from family, friends, or other members of their community. Online services such as VirginMoney.com allow borrowers and lenders to easily establish rates, terms, and documentation for personal, business, or real estate loans. Often borrowers can negotiate better rates and terms than they would get from a traditional lending institution, and lenders can receive better interest rates. In addition, family members can provide more generous loan terms and adjust the loan schedule or forgive payments if necessary. Another online lending service, Prosper.com, goes a step further and creates a marketplace where lenders essentially bid on loans requested by borrowers; rather than just listing a borrower's credit score and loan terms, this site allows potential lenders to view a borrower's personal statement, endorsements from friends, and group affiliations. In addition, each loan can be serviced by multiple lenders, so lenders can diversify their risk.³²⁹ A similar online lending service, Zopa.com, which operates in the United Kingdom, Italy, Japan, and the United States, offers unsecured personal loans to

borrowers with good credit. Unlike Prosper, Zopa underwrites all of its loans and investors' funds are guaranteed and insured by a partner credit union. Investors choose which borrowers to help and can increase their assistance by choosing a lower interest rate.³³⁰

Organizations both large and small can use the Internet to facilitate communication with their members. The Internet encourages peer-to-peer communication on both large and small scales. This phenomenon can be seen in the American political system with decentralized Web sites such as DailyKos.com fostering a community-based political dialogue.³³¹ Similar Web sites such as RedState.com and Townhall.com appeal to those on the right in American politics. In addition, Web sites such as Meetup.com encourage an active civic life by connecting individuals with others who share their common interests. Over 2 million people around the world have used the service to find local groups ranging from political organizations to foreign language clubs.³³²

Many organizations also rely heavily on the Internet for online fundraising. Since Howard Dean first demonstrated the fundraising potential of the Internet in the U.S. presidential primaries of 2004, major and minor political candidates alike have used the Internet to raise millions of dollars. Many tools are available online to help individuals raise funds for their charitable causes. The Web site Active.com offers a variety of tools to organize and fundraise for a charity sporting event. Marathon runners, for example, can form teams, recruit additional members, solicit and track donations, and receive and publish their fundraising and athletic results.

Non-profit organizations also use online tools to track volunteer contact information, skill sets, and performance. Web services such as WhenToHelp.com, available for free to nonprofit organizations, automate volunteer scheduling and let volunteers specify their availability and trade shifts online. A similar product, Count Me In, automates registration and league management for youth sports leagues. These types of tools help make civil society more efficient and allow citizens to more actively participate in their community. Moreover, many of these Web sites not only provide online tools to promote civic action but also develop their own online community. Active.com provides community message boards, blogs, and individual and team profiles where members can share training plans, seek and give advice, and share their stories or success. In addition to improving real-world communities, these Web sites are building new virtual communities of their own. Thus, it's not surprising that the Internet also has enabled the growth of over 100,000 new organizations focused on social issues.³³³

As the Internet becomes more of a tool for watchdog groups to scrutinize the behavior of firms, companies are going to greater lengths to prove, in depth, their socially responsible qualifications. Starbucks, for example, has an entire section of its Web site promoting its partnership with organizations like Save the Children and the American Wildlife Foundation, and

it has published on its site a corporate social responsibility report annually since 2001.³³⁴ The Gap also touts its corporate social responsibility credentials on its Web site and has undertaken an aggressive campaign to showcase its involvement with the RED campaign (dedicated to fighting AIDS in Africa). Since “hiding” bad behavior is much more difficult in the information age, a growing share of corporations are using transparency to build trust in the eyes of stakeholders and to develop a better dialogue with nongovernmental organizations that monitor activities such as unfair labor practices or environmental standards.³³⁵ One corporation, Vodafone, which was ranked as the number one socially responsible company in 2006 by *Fortune*, has a “CR Dialog” page on its corporate social responsibility Web page that links conversations between experts, stockholders, and other interested parties about what actions the cell phone industry can take to become more socially responsible. Vodafone also has a section highlighting third-party audits of the company’s behavior.³³⁶ BP, ranked the number two socially responsible company, has on its Web site a list of socially relevant topics, such as human rights, natural disasters, and HIV, with links to in-depth policy reports, case studies, performance reviews, and future program plans, along with feedback options so users can feel like they are interacting with the company.³³⁷

Corporate social responsibility is moving beyond a marketing campaign to an authentic effort reflected in firms’ business models. The accessibility of corporate information is creating a “race to the top” over which companies can perform the best. Although corporate social responsibility in the past was seen as a necessary cost for corporations, a recent report by IBM demonstrated that two-thirds of the business leaders surveyed used corporate social responsibility as an opportunity for financial gain.³³⁸ *Fortune* reported in 2006 that \$1 out of every \$10 of assets under management was being invested in firms with high ranks on corporate social responsibility scales.³³⁹ The Internet not only is helping to create transparency that reduces harmful business practices but is also allowing corporations to reap the goodwill generated from their good deeds. This goodwill, in turn, creates a stronger partnership between customers and companies, as well as better avenues for companies’ growth.

The Internet is also helping to create global communities. For example, a significant source of capital for the developing world comes from money sent from migrants back to their home country. Transfers of money from foreign workers to their home countries—called remittances—constitute the second largest financial inflow into developing countries, dwarfing international aid.³⁴⁰ A recent study found that in 2006 global remittances totaled three times that of aid provided by donor nations to the developing world.³⁴¹ IT is helping to make expatriate aid more successful by connecting potential donors with those in need. The Web site Muku.com, for example, allows members of Zimbabwe’s diasporas to buy goods such as food and gas over the Internet for family members back home. The site has 10,000 clients so far and intends to expand to serve a half dozen more countries next year.³⁴² In the past, there have been high transaction costs for remittances due to diffuse and

decentralized payment methods and the lack of information provided to migrant workers. Immigrants also use Web sites and online tools to maintain strong links to their hometown and maintain their local identity.³⁴³

Offering More Entertainment Choices

For many years, consumers have had only a handful of entertainment choices. Before cable TV, most consumers had a choice of just a few TV channels, assuming they were even close enough to a TV broadcast to get reception. Before the Internet, consumers could get only the books and music that their local store sold. The digital revolution has led to an explosion of entertainment choices—and it is not too unrealistic to postulate that at some point in the future people will have access online to virtually every song, video, book, and photo ever published.

The place where the expansion in entertainment choices is really playing out is the Internet. Indeed, the variety of video, audio, books, photos, and other entertainment now available online is breathtaking. Beyond opening up entertainment content in people’s home countries, the Internet is making domestic entertainment content available internationally. For example, people can listen to Internet radio stations from around the world to hear news and information from abroad or to enjoy cultural or entertainment programming from distant countries. Movies can be purchased online for viewing. Although there are still some limitations in terms of what movies are available on what terms (e.g., rental versus retail), there is no limit to the number of titles and types of business models that can be implemented online.

To see the online entertainment choices available now to consumers, it is worth looking at what is happening in sports broadcasting. In the past, sports fans wanting to watch a game of their favorite team had to hope it was broadcast on their local TV, an unlikely event if their favorite team was not the team in their local media market. Now the Internet is giving people vastly increased choices in the sports events they can watch. In the United States, all the major sports networks, at a minimum, deliver clips of game highlights online; and most sports networks offer free and paid packages for people who want to watch entire events live and on-demand, with coverage that far outstrips that which is available on TV. During the NCAA (National Collegiate Athletic Association) basketball playoffs, for example, CBS streams live video of all the games online, while the local TV affiliate shows only one game at a time. The expansion of options in sports broadcasting is not limited to domestic sports either. The Internet opens up the world’s arenas to anyone interested in sports who does not get mainstream coverage in their home country. Take soccer or cricket, two sports with huge international followings. Fans of soccer or cricket who do not get coverage in their home country can pay a monthly fee and start watching the games and matches over the Internet so they do not have to miss out. The Internet thus opens up a range of new opportunities for broadcasters and content generators to monetize the distribution of their sporting content.

The Internet is opening up a wide array of entertainment choices that previously could only be viewed or heard live by the people who were present. Indeed, the biggest Internet video success story to date has been the video-sharing site YouTube, which hosts user-submitted content. YouTube and Web sites like it allow anyone to upload a video and share it with the world. By drawing upon the “power of the crowd,” these sites host deep and diverse libraries that feature everything from funny home movies to news and TV clips to video diaries to professionally produced original shows. Such sharing is what allows for the viral growth some videos achieve. A few people see a particular video and like it; they share it either privately with some friends or publicly on a different Web site; and then more people continue to see and share the video with others in their social networks. Over 150,000 videos (totaling more than 30,000 hours of footage) are posted to YouTube each day.³⁴⁴ Moreover, YouTube now streams 1.2 billion videos a day worldwide.³⁴⁵ In 2009, YouTube accounted for more than one-quarter (26 percent) of total time spent viewing video by all Internet users, more than the combined time spent of video content sites ranked between #2 and #25 (22 percent). However, the majority of online video viewing (52 percent) occurred at video sites ranked outside of the top 25, suggesting the increased fragmentation of online video and the emergence of sites in the “long tail.”³⁴⁶

The energy involved in selling \$100 of books is 14 times greater at a retail store than an online bookseller.

As an example of the viral spread of video clips over the Internet, a classic example is the amazing juggling performance Chris Bliss gave with the Beatles “Golden Slumbers” at a 2002 comedy festival, seen live by perhaps a few hundred people. The video clip remained a largely unnoticed posting on Bliss’s personal Web site until early 2006, when someone came across it and sent it to a group of friends. The video quickly became an Internet sensation and, thanks to the wonders of viral marketing, was viewed over 20 million times by mid-April 2006.

Not only has the range of video choices on the Internet exploded; the number of audio choices on the Internet has also grown tremendously. It used to be that radio listeners were limited to the stations their antenna could pick up. Now through Internet radio, listeners can tune in to online versions of over-the-air radio stations from around the world that also stream live over the Web, as well as from thousands of online-only radio stations that can be created by anyone with enough passion for music. Likewise, it used to be that music CDs listeners purchased were limited by what CDs were available in the local store (unless they wanted to wait for a package to arrive in the mail). Now through digital downloads, listeners can access online stores that provide instant access to millions of tracks. Increasingly, listeners can get music directly from their favorite artist, even if they have yet to make a recording deal with a major studio. More and more music is being created exclusively for distribution over the Internet.³⁴⁷

Finally, consumers have vastly more choices for gaming than ever before. All three major game consoles—Microsoft Xbox, Sony PlayStation, and Nintendo Wii—now offer some form of a virtual console on the Internet, where users can download games rather than having to get the game on disc. The Xbox 360’s Live Marketplace, for example, lets users find and buy games from independent developers. In addition, there are thousands of casual games available online that come in all shapes and sizes. And beyond these is the growing marketplace of games offered by mobile providers to be played on cell phones.

SAVING ENERGY: SHIFTING FROM ATOMS TO BITS

By allowing the widespread production, transmission, and consumption of virtual products—replacing bits for atoms—the Internet is paving the way to a more sustainable society. The Internet-enabled “dematerialization” of the economy, in which atoms (e.g., letters written on paper) are increasingly replaced with bits (e.g., e-mail), is leading to energy savings not just from reduced transportation, but also from reduced production of material goods. Take movies and music, for example. For most people, watching a movie at home has in the past required getting into a car and driving to the movie store. But with the emergence of high-speed broadband networks and much easier-to-use home video network systems, movies are now being offered digitally over the Internet. Likewise, instead of getting in a car to drive to the store to buy a music compact disc, increasingly consumers are buying their music from music Web sites like iTunes.com and downloading it to a digital music device. This not only eliminates the trip to the store to get the disk, it eliminates shipping from the CD manufacturer to the wholesaler and the retailer, and saves all the energy used in producing the plastic and the disk. Online music sales are growing rapidly. Apple’s iTunes, the leading online music store, recently became the second most popular music retailer in the United States, behind Wal-Mart, the country’s largest retail firm.³⁴⁸ Apple offers over 10 million tracks and has sold more than 6 billion songs without shipping a single physical CD (or the accompanying plastic packaging) or erecting a single iTunes retail store.³⁴⁹ Fuhr and Pociask have estimated that eliminating the production of CDs and their plastic cases in the United States alone could save 42 million gallons of oil per year while reducing greenhouse gas emissions by a half million tons.³⁵⁰

But digital movies and music are just one manifestation of the larger phenomenon of dematerialization. Paper is a prime example, as the Internet has enabled the digitization of many tasks that used to require paper, including letters, newspapers, office work, and even books, with considerable energy savings and environmental benefits. Paper manufacturing is an extremely energy-intensive process, requiring about 3,405 kilowatt-hours of energy to produce 100 tons of paper.³⁵¹ Thus, getting the news online and reading it on a personal digital assistant (PDA) releases 32 to 140 times less carbon dioxide than reading the news in a newspaper.³⁵² With the advent of Web-based news, newspaper circulation has declined on average 1.7 percent a year

in the United States, and Fuhr and Pociask have estimated that this decline in newspaper circulation has already prevented the release of 7.9 million tons of greenhouse gases from paper news production processes.³⁵³

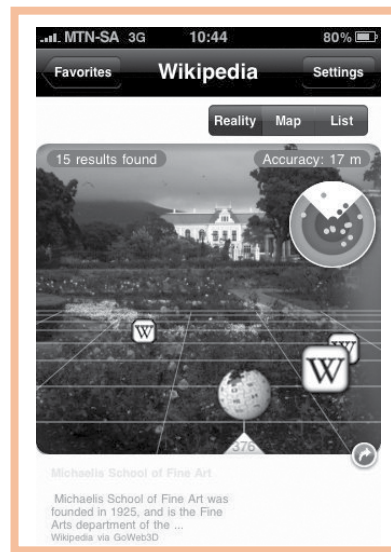
Similarly, instead of relying on paper mail, consumers and businesses are increasingly turning to the Internet to do their banking, pay bills, file taxes, and communicate generally. As a result, the use of first-class mail in the United States has been on the decline, with the number of first-class mail pieces dropping from 103.5 billion pieces in 2002 to 97.6 billion pieces in 2006, saving 184,000 tons of paper—not to mention saving the energy that would have been needed to manufacture all this paper, an estimated 7.4 million British thermal units (BTUs) annually.³⁵⁴

The Internet has had a similar impact on the use of paper checks. There is little wonder that banks have embraced Internet banking, given that processing a check costs banks approximately \$1.40 compared to just 8 cents for processing an Internet-enabled bill payment. The result has been a dramatic decline in the use of paper checks, and the accompanying energy required for their printing and processing. According to the U.S. Federal Reserve, check writing in the United States has declined in recent years, going from 49.5 billion checks paid in 1995 to 36.7 billion checks paid in 2003.³⁵⁵ By 2006, that number had decreased to 30 billion checks paid annually and the number of electronic payments made that year, 60 billion, doubled the number of checks written.³⁵⁶

E-commerce specifically yields significant energy savings. New e-commerce-enabled business practices like Amazon.com's centralized warehousing are actually less damaging to the environment than traditional brick-and-mortar retail operations even though such practices result in increased shipping. The energy involved in selling \$100 of books is 14 times greater at a retail store than an online bookseller.³⁵⁷ A study by Romm finds that a 20-mile round trip to the mall to purchase two five-pound products consumes about 1 gallon of gasoline, whereas shipping the packages 1,000 miles by truck consumes 0.1 gallon of gasoline.

Moreover, the Internet lets consumers shop virtually instead of in person. Even when shopping at some point has to be done in person—one will probably want to tour a house or test drive a vehicle before purchasing it—the Internet significantly reduces the number of houses or stores visited. For example, Ratchford, Talukdar, and Lee found that the use of the Internet to look for new cars reduced the number of dealerships shoppers visited.³⁵⁸

FUTURE TRENDS IN THE INTERNET ECONOMY



*Layar browser,
Cape Town,
2009*

Looking back, the first 25 years of the Internet economy have produced Internet successes like Google, Amazon, and eBay; revolutionized industries such as retail, travel, and stock trading; and reshaped the workforce with more self-service, access to lower-cost labor, and flexible work arrangements. In addition, it has provided consumers with an unprecedented amount of access to information and powerful new tools to become “prosumers.” The potential for innovation and the pace of technology moves so fast that predicting the next 25 years of the Internet economy is difficult. However, over the next decade, one can expect a host of innovative technologies, services, and business models that will continue to enhance productivity and improve quality of life. Furthermore, one can expect a number of current trends to continue in the short and moderate term.

GREATER ADOPTION OF EXISTING TECHNOLOGY

Since 1985, the Internet economy has moved out of its infancy but it still has a long way to go to reach full maturity. While many people use the most popular online applications, many more people could use the Internet. Even mainstream applications such as e-commerce, e-mail, online media, and social networking are not yet routinely used by a large segment of the adult population. Less than 50 percent use e-mail and less than 40 percent use a search engine on a typical day, and only 34 percent of Americans purchased goods or services online.³⁵⁹ Over the next 25 years, much of the progress one should expect to see should come from increased adoption of existing technology. As an increasing percentage of the population integrates themselves into the Internet economy, even higher rates of productivity and societal

benefits should materialize as the value of the network increases with the number of participants. The share of the population today who conduct a meager share of their lives online will likely shrink. More people are likely to spend more time online reading the news; shopping; enjoying entertainment; engaging in health, education, and work activities; and socializing. As more people go online, spurred by faster broadband service, affordable and easier to use technology, and policy initiatives that close the digital divide, such as computer ownership and digital literacy campaigns, Internet use will grow even more.

GREATER USE OF SELF-SERVICE TECHNOLOGY

As more and more users adopt Internet technology there will be further take-up of self-service technology. Calling in an order

for take-out Chinese will seem as passé as using dial-up Internet, paper forms will become increasingly obsolete, and information will become even more accessible online. Greater use of self-service technology will enable an array of benefits from increased productivity to more consumer convenience to lower prices. As more people become comfortable with self-service applications in areas such as e-commerce and e-government, organizations will invest more in these technologies, and these investments will enable lower prices and the sale of more goods and services. While in-person service will never completely disappear, the future Internet economy will likely include more innovative self-service applications that empower consumers.

MORE HIGH-BANDWIDTH APPLICATIONS

Only in recent years have broadband networks reached the speeds necessary to deliver media-rich, interactive Web browsing. One trend likely to continue into the future is the adoption by consumers and businesses of faster broadband connections, especially as more content and services, such as voice over IP and streaming video, are delivered over Internet connections instead of traditional cable or phone services. Already countries with next-generation broadband networks such as Korea and Japan have seen the emergence of high-definition video applications that demand very high bandwidth. Fast Internet connections have also already generated considerable interest in cloud computing. Use of cloud computing will likely continue to grow as cloud computing service providers can provide an efficient computing platform that scales well to serve equally well either hundreds of users or millions of users.

But the true potential of next-generation high-speed broadband networks lies in the transformative new capabilities they enable.³⁶⁰ These functionalities—including real-time collaboration tools such as videoconferencing and telepresence, faster file transfers, and streaming media—will support a broad range of networked applications delivering tremendous benefits to consumers, academic institutions, businesses, society, and the economy. For example, data-intensive applications, such as telepresence, will be able to flourish once faster Internet connections go mainstream both in deployment and adoption.

GREATER USE OF THE MOBILE INTERNET

Ubiquitous connectivity is likely to emerge as one of the defining attributes of the Internet economy over the next quarter century. The mobile Internet, accessible on smart phones, netbooks, tablet PCs, and mobile media devices such as video players and e-book readers, untethers users so they can enjoy the benefits of the Internet from anywhere. The mobile Internet is already available in many places—including cars, trains, and airplanes—but cost, speed, and availability are still barriers to wider adoption. Wider deployment of fourth-generation (4G) wireless technologies such as LTE or WiMax and their successors will help create the foundation for new applications and services, as the mobile speeds of tomorrow will exceed the wired speeds of today. Continued IT advancements will also enable electronics that

are increasingly fast, energy-efficient, and low-cost, including wearable computing systems that may someday replace “point-and-click” with “point-and-think.” And increasingly the mobile Internet will be much more than surfing a Web site while sitting in a park; it will enable engagement in a wide array of Internet enabled activities and transactions.

GROWTH OF LOCATION-BASED SERVICES

More online applications will implement or use location-based services. Location data can be used to improve the quality of search, communication tools, social networking, games, applications and targeted advertising. As applications like Twitter integrate geo-location metadata with user-generated content, other users can use location-aware applications that allow them to find data submitted by others in a specific location. For example, concert-goers can use this feature to socialize with other attendees or neighbors can use it to share information within a neighborhood.

Next-generation broadband networks will empower the Internet with expanded functionalities—including real-time collaboration tools such as videoconferencing and telepresence, faster file transfers, and streaming media—that will support a broad range of new Web-based applications.

One of the most hyped location-based services today is augmented reality (AR). AR is the addition of electronic data to the physical world. This can be implemented by overlaying contextual information, downloaded from the Internet, on a graphical representation of the physical world. For example, individuals can use the camera and display features of a smart phone to display a live view of the world around them with computer-generated information layered on top. Mobile applications, like the Layar or Wikitude browsers, allow smart phone users to combine real-world views with online information, such as Wikipedia entries associated with a specific point-of-interest or reviews about a nearby restaurant. Using an iPhone application from the company acrossair, users can find the closest subway station in New York City, learn which lines it serves, and get walking directions.³⁶¹ Similar services have long been available in Korea. Not all AR applications are limited to smart phones. A driver using a global positioning system (GPS) might view a real-time display of the road with directions embedded on the screen, rather than a simple animated map of the road.

SMART WORLD

Currently the Internet economy exists almost in parallel to the physical world. Indeed, many initially conceived of cyberspace as being a separate place then physical space. But in the future, the Internet will increasingly be integrated with the world around us. Advances in technology such as low-cost sensors, low-power

processors, and advanced wireless networking are leading to the creation of an active world that is alive with information.

Already we are seeing the beginnings of this trend. Companies are offering “smart home” technology that enables individuals to control their lights from a laptop, turn on their heaters using their iPhone, and schedule recordings on their TiVos from their offices. Utilities are rolling out smart meters, electricity meters that automate a range of energy management functions such as collecting energy usage and starting and stopping services. In the future, these meters will offer variable pricing to consumers so that, for example, they can adjust their energy usage to off-peak times to save money and be more energy efficient. Intelligent transportation systems integrated with GPS navigators such as Telenav on smart phones already let users know about real-time traffic conditions and advise drivers on optimal route navigation patterns to take less congested routes. Future advances will make these systems bi-directional, integrating traffic patterns with traffic signal lights. The adoption of IPv6 (Internet Protocol version 6) will mean that Internet addresses will be available for every device, sensor, and even person on the planet. Once IPv6 is fully implemented, there will be more IP addresses than grains of sand on the planet. IPv6 will also provide enhanced security, improved network management, and a better mobile experience.

Finally, a world that is alive with information will also mean more personalization. Devices connected to the Internet will be able to deliver services and information customized for each individual.

CONCLUSION

As this study has comprehensively documented, the Internet economy has transformed almost every facet of life for citizens in developed countries, and is increasingly doing so for those in developing countries as well. The commercial Internet has unleashed new business models, ushered in a plethora of new products and services, drawn individuals and communities throughout the world together in ways never before possible, substantially increased consumer convenience, and dramatically increased the quality of life and incomes for millions of the world's citizens.

From humble beginnings 25 years ago, the commercial Internet has grown to become a general purpose technology whose impact has already left an indelible mark on history. Yet going forward, we should expect to see even more, as global Internet adoption continues to increase, as connectivity technologies bring faster Internet speeds into homes and businesses, and as access to the Internet proliferates across a multitude of mobile devices and platforms. In fact, some experts believe that the Internet revolution is, even now, less than 15 percent complete.³⁶²

To ensure that the commercial Internet reaches its full potential, nations must continue to remain vigilant to ensure the trust

and security of the Internet; to support both the deployment of broadband technologies that bring high-speed Internet access into homes and businesses and the proliferation of personal or mobile computing devices through which to access the Internet; to ensure that companies have incentives to invest in Internet-enabled business practices; and to ensure that their citizenry becomes digitally literate so they can enjoy the benefits made possible by the Internet economy.

So to the commercial Internet, congratulations on hitting your 25th birthday; you're just starting to enter the prime of your working years!

APPENDICES

Appendix A: Total domain names per OECD country, and as a percent of world total, 2008

Country	Total Domains	Percent of World Total
United States	55,308,080	34.14%
Germany	17,835,570	11.01%
China	15,000,000	9.26%
United Kingdom	11,555,646	7.13%
Canada	4,414,311	2.72%
The Netherlands	4,282,132	2.64%
France	3,515,169	2.17%
Italy	2,886,978	1.78%
Australia	2,779,424	1.72%
Japan	2,678,809	1.65%
Spain	2,255,508	1.39%
Korea	1,951,926	1.20%
Switzerland	1,553,672	0.96%
Sweden	1,240,015	0.77%
Denmark	1,164,023	0.72%
Belgium	1,140,340	0.70%
Poland	1,115,309	0.69%
Turkey	1,099,517	0.68%
Austria	1,093,258	0.67%
Norway	665,277	0.41%
Czech Republic	571,994	0.35%
Mexico	563,035	0.35%
New Zealand	548,887	0.34%
Finland	432,794	0.27%
Hungary	430,925	0.27%
Portugal	407,675	0.25%
Ireland	352,866	0.22%
Greece	336,684	0.21%
Slovak Republic	183,715	0.11%
Luxembourg	80,439	0.05%
Iceland	39,223	0.02%
OECD Total	125,591,660	77.53%
World Total	162,000,000	100.00%

Source: OECD, *Communication Outlook 2009*

Appendix B: Internet selling and purchasing by industry 2006, percent of businesses

		Selling	Purchasing
Australia (2005)	Construction	20.7	44.0
	Manufacturing	20.6	32.6
	Real estate, renting & business activities	11.1	41.6
	Transport, storage & communication	36.4	49.9
	Wholesale	25.7	66.4
	Retail	11.1	40.6
	All industries	17.2	45.2
Austria	Construction	3.8	26.3
	Manufacturing	14.4	30.6
	Real estate, renting & business activities	7.5	47.1
	Transport, storage & communication	14.4	32.9
	Wholesale & Retail	17.8	39.8
	All industries	15.4	36.5
Belgium	Construction	5.3	10.5
	Manufacturing	16.3	11.6
	Real estate, renting & business activities	10.8	30.9
	Transport, storage & communication	14.8	8.7
	Wholesale & Retail	18.2	17.0
	All industries	14.8	15.9
Canada	Construction	0.6	65.5
	Manufacturing	11.9	67.9
	Real estate, renting & business activities	20.0	53.8
	Transport, storage & communication	7.0	49.5
	Wholesale	16.0	66.6
	Retail	19.9	57.6
	All industries	12.5	61.6
Czech Republic	Construction	3.7	11.1
	Manufacturing	8.1	13.9
	Real estate, renting & business activities	8.5	24.0
	Transport, storage & communication	8.9	14.1
	Wholesale & Retail	9.0	20.4
	All industries	8.2	16.9
Denmark	Construction	21.5	27.9
	All industries	33.9	33.9
Finland	Construction	..	12.3
	Manufacturing	18.8	..
	Real estate, renting & business activities	..	32.1
	Transport, storage & communication	13.4	..
	Wholesale & Retail	..	33.5
	All industries	13.6	23.1
France	Construction	6.8	8.5
	Manufacturing	24.9	18.0
	Real estate, renting & business activities	17.1	25.2
	Transport, storage & communication	21.2	16.8
	Wholesale & Retail	16.3	28.2
	All industries	18.4	20.7

Appendix B (continued)

		Selling	Purchasing
Germany	Construction	8.9	38.5
	Manufacturing	22.5	45.9
	Real estate, renting & business activities	11.8	58.7
	Transport, storage & communication	17.6	38.7
	Wholesale & Retail	18.2	48.3
	All industries	18.1	47.6
	Greece	Construction	0.7
Manufacturing		4.5	9.1
Real estate, renting & business activities		6.1	17.0
Transport, storage & communication		11.0	9.5
Wholesale & Retail		4.8	14.3
All industries		7.3	11.2
Hungary		Construction	1.0
	Manufacturing	10.9	9.6
	Real estate, renting & business activities	6.6	10.2
	Transport, storage & communication	8.1	7.2
	Wholesale & Retail	9.0	17.5
	All industries	8.6	10.8
	Iceland	Construction	8.3
Manufacturing		19.5	35.4
Real estate, renting & business activities		25.7	50.9
Transport, storage & communication		33.7	23.3
Wholesale & Retail		23.2	47.9
All industries		22.0	37.6
Ireland		Construction	3.9
	Manufacturing	23.8	54.4
	Real estate, renting & business activities	14.0	65.8
	Transport, storage & communication	31.1	57.4
	Wholesale & Retail	21.4	49.7
	All industries	22.7	52.8
	Italy	Construction	0.7
Manufacturing		1.6	6.8
Real estate, renting & business activities		2.2	20.2
Transport, storage & communication		0.8	8.0
Wholesale & Retail		3.0	14.4
All industries		2.8	9.7
Japan (2005)		Construction	3.5
	Manufacturing	14.0	21.3
	Transport, storage & communication	8.8	16.0
	All industries	15.2	20.1

Appendix B (continued)

		Selling	Purchasing
Korea (2005)	Construction	8.0	36.5
	Manufacturing	9.2	29.1
	Real estate, renting & business activities	5.0	30.7
	Transport, storage & communication	7.8	28.1
	Wholesale	15.0	27.8
	Retail	9.1	33.1
	All industries	7.5	32.5
Luxembourg	Construction	6.1	23.0
	Manufacturing	16.3	28.8
	Real estate, renting & business activities	8.4	44.9
	Transport, storage & communication	14.5	24.1
	Wholesale & Retail	12.5	31.3
	All industries	11.5	30.3
Mexico (2003)	Construction	4.0	6.0
	Manufacturing	2.0	1.8
	Real estate, renting & business activities	2.1	6.4
	Transport, storage & communication	1.1	2.2
	Wholesale	1.3	2.7
	Retail	16.7	5.6
	All industries	2.2	2.2
Netherlands	Construction	10.3	26.3
	Manufacturing	28.2	31.0
	Real estate, renting & business activities	17.5	38.4
	Transport, storage & communication	31.1	26.8
	Wholesale & Retail	25.6	30.6
	All industries	23.3	31.8
New Zealand	Construction	23.7	56.2
	Manufacturing	42.6	58.2
	Real estate, renting & business activities	34.6	76.4
	Transport, storage & communication	50.4	53.9
	Wholesale	41.5	56.5
	Retail	28.0	48.8
	All industries	36.7	58.8
Norway	Construction	26.7	47.1
	Manufacturing	..	40.6
	Real estate, renting & business activities	22.7	62.5
	Transport, storage & communication	..	37.1
	Wholesale & Retail	27.2	..
	All industries	27.5	48.8
Poland	Construction	3.2	10.0
	Manufacturing	10.4	12.7
	Real estate, renting & business activities	5.7	17.6
	Transport, storage & communication	13.5	15.3
	Wholesale & Retail	10.3	20.8
	All industries	9.3	15.6

Appendix B (continued)

		Selling	Purchasing
Portugal	All industries	7.1	14.4
Spain	Construction	2.1	8.0
	Manufacturing	10.1	12.1
	Real estate, renting & business activities	6.3	19.8
	Transport, storage & communication	9.6	14.6
	Wholesale & Retail	9.3	22.2
	All industries	8.4	14.7
Sweden	Construction	14.4	33.5
	Manufacturing	25.8	38.4
	Real estate, renting & business activities	19.5	56.0
	Wholesale & Retail	30.0	51.7
	All industries	23.9	44.4
Switzerland (2005)	Construction	6.0	45.0
	Manufacturing	17.0	56.0
	Services	31.0	59.0
	All industries	25.0	57.0
United Kingdom	Construction	18.8	32.4
	Manufacturing	46.0	51.8
	Real estate, renting & business activities	22.7	60.4
	Transport, storage & communication	31.1	41.1
	Wholesale & Retail	28.8	47.8
	All industries	30.4	50.6

Source: OECD, *The Future of the Internet Economy*, 2008

Appendix C: Secure servers, OECD countries, 2008³⁶³

Country	Number Secure Servers, 2008	Percent Growth, 1998-2008	Secure Servers Per GDP Rank
Iceland	483	3,615%	1
New Zealand	3,881	4,212%	2
Denmark	5,242	11,814%	3
Australia	19,264	2,948%	4
United States	343,164	2,239%	5
Netherlands	15,951	12,460%	6
United Kingdom	51,386	7,097%	7
Canada	28,905	3,011%	8
Switzerland	6,992	4,500%	9
Sweden	6,568	4,430%	10
Finland	3,318	4,779%	11
Ireland	2,784	4,871%	12
Germany	41,954	8,427%	13
Norway	3,654	6,544%	14
Japan	55,660	12,874%	15
Austria	3,762	3,739%	16
Luxembourg	406	3,591%	17
Belgium	2,418	4,550%	18
Czech Republic	1,396	7,247%	19
Spain	7,267	2,941%	20
France	10,076	4,439%	21
Portugal	1,102	3,981%	22
Poland	2,702	11,648%	23
Hungary	733	3,972%	24
Korea	4,992	13,037%	25
Italy	5,082	2,943%	26
Slovak Republic	252	1,580%	27
Greece	642	7,925%	28
Mexico	1,531	5,788%	29
OECD Total	635,315	3,143%	

Source: OECD, *Communication Outlook 2009*

Appendix D: Number of domain names by U.S. state, 2007

2008 Rank	State	Domain Names	Domains/Firm
1	Nevada	672,019	12.3
2	Virginia	1,974,303	11.12
3	Arizona	1,041,037	8.81
4	Utah	533,779	8.48
5	Washington	1,448,424	7.43
6	California	7,473,464	6.95
7	Hawaii	209,336	6.87
8	Florida	2,866,944	6.05
9	Delaware	155,168	6.03
10	Texas	2,315,673	5.61
11	New York	2,430,780	5
12	Oregon	533,214	4.99
13	Massachusetts	913,517	4.98
14	Colorado	754,964	4.95
15	Maryland	686,690	4.92
16	Vermont	104,386	4.87
17	Georgia	990,819	4.79
18	New Hampshire	183,381	4.51
19	Tennessee	498,795	4.47
20	Illinois	1,253,195	4.31
21	Connecticut	410,772	4.19
22	North Carolina	773,020	4.14
23	New Jersey	1,043,294	4.02
24	Minnesota	530,957	3.98
25	New Mexico	157,989	3.66

2008 Rank	State	Domain Names	Domains/Firm
26	Alaska	61,503	3.63
27	Pennsylvania	1,012,825	3.61
28	Michigan	769,634	3.59
29	Ohio	822,673	3.56
30	Rhode Island	118,492	3.52
31	Indiana	433,342	3.45
32	South Carolina	328,957	3.43
33	Missouri	464,376	3.4
34	Idaho	152,911	3.3
35	Louisiana	309,208	3.18
36	Oklahoma	245,448	3.16
37	Alabama	274,224	3.11
38	Wisconsin	389,895	3.05
39	Montana	108,336	3.04
40	Kansas	195,794	2.8
41	Maine	113,414	2.76
42	Kentucky	233,599	2.75
43	Nebraska	126,956	2.7
44	Wyoming	55,296	2.67
45	North Dakota	51,347	2.62
46	Iowa	174,353	2.47
47	Arkansas	137,676	2.2
48	South Dakota	53,039	2.18
49	Mississippi	103,822	1.9
50	West Virginia	69,402	1.89
Total		36,762,442	5.09

Source: Matthew Zook, 2008

Appendix E: U.S. B2B e-commerce by sector, 2002-2007 (\$M)

Year		Manufacturing	Wholesalers	Retail Trade	Selected Services
2007	Total	\$5,305,935	\$5,782,065	\$3,994,823	\$6,763,712
	E-commerce	\$1,855,719	\$1,226,071	\$126,697	\$124,122
	Percent of Total	35.0	21.2	3.2	1.8
2006	Total	\$5,015,553	\$5,526,221	\$3,869,536	\$6,385,177
	E-commerce	\$1,566,799	\$1,193,962	\$107,014	\$103,697
	Percent of Total	31.2	21.6	2.8	1.6
2005	Total	\$4,742,076	\$5,164,302	\$3,687,364	\$5,949,425
	E-commerce	\$1,343,852	\$1,118,274	\$87,846	\$89,712
	Percent of Total	28.3	21.7	2.4	1.5
2004	Total	\$4,308,971	\$4,799,679	\$3,474,340	\$5,539,481
	E-commerce	\$996,174	\$962,675	\$71,087	\$79,726
	Percent of Total	23.1	20.1	2.0	1.4
2003	Total	\$4,015,081	\$4,345,336	\$3,265,477	\$5,114,011
	E-commerce	\$842,666	\$880,908	\$56,719	\$64,310
	Percent of Total	21.0	20.3	1.7	1.3
2002	Total	\$3,920,632	\$4,151,597	\$3,134,322	\$4,900,995
	E-commerce	\$751,985	\$806,589	\$44,925	\$59,966
	Percent of Total	19.2	19.4	1.4	1.2
2001	Total	\$3,970,500	NA	\$3,067,725	NA
	E-commerce	\$724,228	NA	\$34,451	NA
	Percent of Total	18.2	NA	1.1	NA
2000	Total	\$4,208,582	NA	\$2,988,756	NA
	E-commerce	\$755,807	NA	\$27,720	NA
	Percent of Total	18.0	NA	0.9	NA

Source: E-Stats, 2009

Appendix F: B2B e-commerce within U.S. manufacturing industries, 2007 (\$M)

Industry	E-commerce	Percent
Total Manufacturing	\$1,855,719	35%
Food products manufacturing	\$202,684	35%
Beverage and tobacco manufacturing	\$72,049	56%
Textile mills	\$14,188	40%
Textile product mills	\$13,499	47%
Apparel manufacturing	\$7,280	30%
Leather and allied product manufacturing	\$1,347	24%
Wood product manufacturing	\$19,422	19%
Paper manufacturing	\$61,128	35%
Printing and related support activities	\$25,645	25%
Petroleum and coal products manufacturing	\$189,934	31%
Chemicals manufacturing	\$247,150	34%
Plastics and rubber products manufacturing	\$61,405	29%
Nonmetallic mineral products manufacturing	\$22,669	18%
Primary metals manufacturing	\$79,431	31%
Fabricated metal products manufacturing	\$82,062	24%
Machinery manufacturing	\$109,197	31%
Computer and electronic products manufacturing	\$141,551	36%
Electrical equipment, appliances, and components	\$40,606	31%
Transportation equipment manufacturing	\$409,424	56%
Furniture and related products manufacturing	\$22,489	26%
Miscellaneous manufacturing	\$32,558	22%

Source: U.S. Bureau of the Census, 2007

Appendix G: Percent of turnover from e-commerce in Europe by firm size, 2009

Country	Large (>250)	Medium (50-249)	SME (10-249)	Small (10-49)
EU 27	17	10	7	4
EU 15	17	10	7	4
Bulgaria	1	1	2	3
Czech Republic	22	10	9	8
Germany	20	12	9	5
Ireland	29	21	22	24
Greece	2	3	2	1
Spain	15	7	5	4
France	17	15	10	4
Cyprus	1	1	1	1
Latvia	2	8	6	3
Lithuania	6	15	12	8
Hungary	24	8	5	3
Malta	52	3	2	2
Netherlands	14	12	10	8
Austria	16	11	8	4
Poland	11	N/A	4	N/A
Portugal	13	15	11	6
Romania	3	1	1	1
Slovenia	11	N/A	N/A	N/A
Slovakia	17	3	3	3
Sweden	N/A	N/A	N/A	5
United Kingdom	21	10	7	4
Croatia	14	16	13	11
Norway	25	22	17	13

Source: E-Stats, 2009

ENDNOTES

- ¹ Interestingly, Microsoft Windows also turns 25 in 2010, as Version 1.0 of Windows shipped in 1985. No doubt there has been complementarity in the successful global diffusion and adoption of both the Internet and Windows.
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- ⁶ Richard G. Lipsey, “Transformative Technologies in the Past Present and Future: Implications for the U.S. Economy and U.S. Economic Policy,” presentation at ITIF Breakfast Forum, July 15, 2008, <http://www.itif.org/files/2008-07-15-lipsey.pdf>.
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- ⁹ A portion of the ARPANET directory from January 1974 can be seen at <http://www.bortzmeyer.org/files/hosts.txt-1974.pdf>. Its format is very similar to the “hosts.txt” file maintained by SRI NIC into the late 1980s.
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- ¹⁷ Rajiv C. Shah and Jay P. Kesan, “The Privatization of the Internet’s Backbone Network,” National Science Foundation, http://www.governingwithcode.org/journal_articles/pdf/Backbone.pdf.
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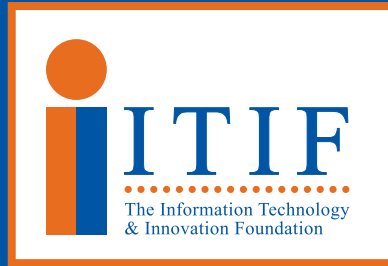
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