Internet Matters

Essays in Digital Transformation

McKinsey & Company

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Internet Matters

Essays in Digital Transformation

Dr. Jacques Bughin and Dr. James Manyika

March 2012

Preface

This compendium is organized around a collection of essays by experts from the McKinsey Global Institute, McKinsey's High Tech Practice, and McKinsey's Business Technology Office that tackle the theme of digital transformation as part of our continuing major research program on the economic impact of information technology. This volume also explores how Web standards are evolving, how the Internet is infiltrating all enterprises, and how the Internet is creating new playing fields with "Big Data", "nowcasting", and innovative models of competitive intelligence.

The essays are organized into four sections. The first section—*The Internet at scale*—drills into how Internet technologies at large (that is, the Web, social technologies, cloud computing, etc.) enhance competitive stance, translating into significant macro-economic performance in both mature and developing economies. The essays also consider how those companies that are morphing their organizations to networked-based structures are reaping the largest benefits of this Internet revolution.

The second section—*The "Big Data" revolution*—looks at how the flurry of data materializing from digitization creates major economic surplus, on top of Internet technologies. This data, provided it is used wisely and with the consent of its "owners", can be used to build new and real time competitive insights. It has also inspired the creation of new sciences, such as nowcasting.

The third section—*Impact on TMT*—translates all of the above into case studies from the telecom, media, and high-tech industries. The last section—*Outside voices*—features interviews with Internet leaders that were originally published in *The McKinsey Quarterly*.

We have had the privilege to present this research in various forums and outlets, including the e-G8 Forum, the B20 Business Summit, the World Economic Forum in Davos, the Aspen Institute, Techonomy, the Economist Ideas Economy: Information Conference, the London Conference on Cyberspace, the White House Open Innovation Event, *The McKinsey Quarterly*, the SSRN network, and the *Journal of Direct, Data, and Digital Marketing Practice*.

Distinguished experts outside McKinsey reviewed the research on which these essays are based and provided invaluable insights and advice. We should particularly thank our advisers Martin N. Baily, Schwartz Chair and senior fellow of the Brookings Institution and former chair of the US President's Council of Economic Advisers; Hal R. Varian, emeritus professor in the School of Information, the Haas School of Business, and the Department of Economics at the University of California at Berkeley, and chief economist at Google; Christian Saint-Etienne, professor of business economics at the Conservatoire National des Arts et Métiers in Paris and member of the Conseil d'Analyse Economique, reporting to the French Prime Minister; Bill Dutton, a professor of Internet studies at the University of Oxford; and Nahed Azab, an assistant professor at American University in Cairo and an expert in e-government. We are also grateful for the input provided by Andrew McAfee, principal research scientist at the MIT Center for Digital Business.

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The Internet at scale

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The macroeconomic impact of the Internet

This white paper was written for the keynote speech at the first Global e-G8 Summit, France, May 2011. All rights reserved.

In two decades the Internet has shifted from a network for researchers to a day-to-day reality for billions of people who use it to search, for e-commerce, social networking and many other activities. Yet the magnitude of the economic impact of Internet-related activities is not obvious. Does the Internet create wealth or just displace it? How large is the economic impact of the Internet? The tag line is overwhelmingly positive: the Internet at large contributes to between 20 to 25 percent (to date) of the G-8 economic growth. For each job removed, more than two new jobs have been directly or indirectly created in the economy.

Dr. Jacques Bughin, Dr. Michael Chui, Eric Hazan, Dr. James Manyika, Matthieu Pélissié du Rausas, and Rémi Said

Executive summary

Two billion people are connected to the Internet. Almost $8 trillion exchange hands each year through e-commerce. In some developed markets, about two-thirds of all businesses have a Web presence of some kind, and one-third of small and medium-sized businesses extensively use Web technologies.[1] The Internet has transformed the way we live, the way we work, the way we socialize and meet, and the way our countries develop and grow. In two decades, the Internet has changed from a network for researchers and geeks to a day-to-day reality for billions of people. Our research sheds new light on this revolution and helps explain the direct link between the Internet and economic vitality.

Many have compared the dawn of the Internet to another communications game changer, the introduction of the Gutenberg press five centuries earlier. But a comparison with the development and commercialization of electric power may be more appropriate.[2] Among its many other consequences, electricity changed the landscape of cities around the world, allowing elevators that can travel great heights and heralding the dawn of massive skyscrapers. As with electricity, the Internet has changed the global landscape. The Internet bridges vast distances and has made the world flatter by allowing instant access to an almost endless stream of information

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1   The sources for these statistics are the World Bank, 2009; Gartner, 2010; Eurostat, 2010; and a McKinsey & Company Internet survey of more than 4,800 small and medium-sized enterprises.

2   Nicholas Carr, *The big switch: Rewiring the world, from Edison to Google,* New York: W.W. Norton & Company, 2009.

that can be immediately brought into play. Its impact on economic wealth reaches well beyond pure players in the industry. Indeed, the brunt of its economic contribution derives from established industries that, in the shadow of the Internet, have become more productive, have created more jobs, have increased standards of living, and have contributed more to real growth. Our research shows that more than 75 percent of the value added created by the Internet is in traditional industries.

Also, as with electricity, the Internet has influenced every corner of the world, not just those countries that pushed its original development or were instrumental in its growth. As Internet usage spreads to even the most remote communities—where gas-powered generators and satellite links make the connection—its observable positive effects grow. As evidence, the United Nations in its Millennium Development Goals lists Internet penetration as a key metric in efforts to reduce poverty and encourage rational development.

Yet despite its ubiquity, little is known about how much value the Internet contributes to national economies. To help fill this gap, McKinsey has conducted extensive research on the contribution of the Internet to GDP and economic growth in the G8 economies and five other key countries at various levels of development: Brazil, China, India, South Korea, and Sweden.

The study, drawn from public sources and targeted surveys, examines the Internet ecosystem, how it is being framed, and who is doing the framing. For the first time, we believe, this work offers a quantitative assessment of the impact of the Internet on GDP and growth while also considering the most relevant tools governments and businesses can use to get the most benefit from the Internet.

1. The Internet is contributing strongly to wealth

The Internet embraces all of us: businesses, individuals, governments, and entrepreneurs. The Web has made possible new waves of business models and entrepreneurship but has also led to radical innovations for accessing, using, and delivering goods and services for everyone. It has transformed industries and governments through innovative approaches and changed how users engage the world.

The Internet is already a significant contributor to the economies of the 13 countries we studied—economies that account for more than 70 percent of global GDP—exerting a strong influence on economic growth rates particularly in mature economies.

To measure the Internet's impact on a country's economy and to understand how the Internet is framed worldwide, we structured the analysis around its two primary components: consumption and expenditure on one hand, and supply on the other.

Internet consumption and expenditure contributes significantly to the economy

Looking at Internet-related usage through expenditure and consumption first, we see:

- **The Internet is big and continues to grow and reach everywhere.** The Internet is now used in every country, in every sector, in most companies, and by more than 2bn people and it is still growing. Internet-related consumption and expenditure is now bigger than agriculture or energy, and our research shows that the Internet accounts for, on average, 3.4 percent of GDP in the 13 countries we studied. If Internet consumption and expenditure were a sector, its weight in GDP would be bigger than energy, agriculture, or several other critical industries. The

Internet's total contribution to the GDP is bigger than the GDP of Spain or Canada, and it is growing faster than Brazil.

- **The Internet is still in its infancy, and the weight of the Internet in GDP varies drastically, even among countries at the same stage of development.** While the Internet accounts for around 6 percent of GDP in advanced countries such as Sweden and the United Kingdom, in 9 out of the 13 countries its contribution is below 4 percent, leaving tremendous room for further Internet development.

- **The Internet is a critical element of growth.** Both our macroeconomic approach and our statistical approach show that, in the mature countries we studied, the Internet accounted for 10 percent of GDP growth over the past 15 years. And its influence is expanding. Over the past five years, the Internet's contribution to GDP growth in these countries doubled to 21 percent. If we look at all 13 countries in our analysis, the Internet contributed 7 percent of growth over the past 15 years and 11 percent over the past five. This is a reflection of small and medium-sized enterprises (SMEs) receiving a performance boost from the Internet. As part of our research, we surveyed more than 4,800 SMEs in the countries we studied.[3] We found that those with a strong Web presence grew more than twice as quickly as those that had minimal or no presence, an outcome that holds across sectors. In addition, SMEs that took advantage of the Internet reported the share of total revenues that they earned from exports was more than twice as large as that reported by others. They also created more than twice the number of jobs as others.

- **The maturity of the Internet correlates with rising living standards.** Leveraging endogenous economic growth theory, we have been able to show that Internet maturity correlates with growth in per capita GDP. Using the results of the correlation, a simulation shows that an increase in Internet maturity similar to the one experienced in mature countries over the past 15 years creates an increase in real GDP per capita of $500 on average during this period. It took the Industrial Revolution of the 19th century 50 years to achieve same results.[4] This shows both the magnitude of the positive impact of the Web at all levels of society and the speed at which it delivers benefits.

- **The Internet is a powerful catalyst for job creation.** Some jobs have been destroyed by the emergence of the Internet. However, a detailed analysis of the French economy showed that while the Internet has destroyed 500,000 jobs over the past 15 years, it has created 1.2 million others, a net addition of 700,000 jobs or 2.4 jobs created for every job destroyed. This conclusion is supported by McKinsey's global SME survey, which found 2.6 jobs were created for every one destroyed.

- **The Internet drives economic modernization.** The Internet's main impact is through the modernization of traditional activities. Although the Internet has resulted in significant value shifts between sectors in the global economy, our research demonstrates that all industries have benefited from the Web. Indeed, in McKinsey's global SME survey, we found that 75 percent of the economic impact of the Internet arises from traditional companies that don't define themselves as pure Internet players. The businesses that have seen the greatest value creation have benefits from innovation leading to higher productivity triggered by the Internet.

- **The impact of the Internet goes beyond GDP, generating astonishing consumer surplus.** Beyond its impact on GDP, the Internet creates substantial value for users, ranging from €13 ($18) a month per user in Germany to €20 ($28)

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in the United Kingdom.[5] In total, the consumer surplus generated by the Internet in 2009 ranged from €7 billion ($10 billion) in France to €46 billion ($64 billion) in the United States.

The rapidly shifting supply side offers some contrasts

Looking at the "supply" of the Internet globally, we find that countries with a strong Internet ecosystem also have a high Internet contribution to GDP. However, the global Internet landscape is shifting rapidly and offers some interesting contrasts:

- **The United States leads the global Internet supply ecosystem.** The United States captures more than 30 percent of global Internet revenues and more than 40 percent of net income. Using a proprietary model, the McKinsey Internet Supply Leadership Index, we show that the United States remains the largest player in the Internet supply ecosystem. It is the country with the most diverse structure within the global ecosystem among the 13 we analyzed in this research, garnering relatively equal contributions from hardware, software and services, and telecommunications.

- **The United Kingdom and Sweden are changing the game.** These two countries have leveraged very strong Internet usage across the board to gain greater importance within the global Internet ecosystem. This move is helped by the strength and strong performance of their telecom operators.

- **India and China are strengthening their position** in the global Internet ecosystem rapidly. Both countries show growth rates of more than 20 percent.

- **France, Canada, and Germany have strong Internet usage.** All three could leverage this usage to increase their presence in the global supply ecosystem.

- **South Korea is rapidly accelerating** its influence on the Internet economy at a faster rate than Japan.

- **Brazil, Russia, and Italy are in the early stages of Internet supply.** They all have strong potential for growth.

Only strong Internet ecosystems can capture maximum value. We find that to build a strong ecosystem, the best performers focus their efforts on four critical areas:

- **Promote human capital.** The United States in particular has used its vast talent pool effectively compared to other countries. Its relative attractiveness to talent with the right skills has been critical in the creation of a strong Internet ecosystem, and this human capital has been nurtured in universities, corporate research and development centers, startups and elsewhere. However, the US will increasingly compete for such talent with other countries.

- **Ease access to financial capital.** The United States, Israel, and South Korea have all ensured sufficient financial capital is available and the mechanism for capital formation in place to nurture innovation and support entrepreneurial resolve.

- **Develop infrastructure.** Infrastructure, the backbone of the entire Internet ecosystem, is an irreplaceable prerequisite. It creates the platforms upon which users, and organizations experience the Internet, and upon which entrepreneurs and businesses innovate.

- **Create an attractive business environment.** The context in which business operates is critical to the growth of the Internet ecosystem and will hold back its growth if the environment does not encourage expansion of usage, encouragement

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5   Internet Advertising Board, *Assessing the consumer benefits of online advertising,* July 2010.

of innovation, and business investment and participation. To ensure such an attractive environment requires ongoing assessment of the frameworks that govern access, usage, protection of various rights, and considerations of security.

2. Leveraging the Internet to revive the engine of growth

Armed with a better understanding of how—and how much—the Internet contributes to national economies, policy makers and business executives can focus their efforts more acutely and effectively to promote and strengthen their domestic Internet ecosystems. In particular, they should consider the following immediate practical steps:

- **Public decision makers should act as catalysts to unleash the Internet's growth potential.** Governments could leverage Internet public spending as a catalyst for innovation. Indeed, countries with the highest public investment in the Internet are also those with the largest nonpublic Internet contribution to GDP. Governments' own use of the Internet encourages citizens to use it. Government e-transformation creates large-scale, complex demand that stimulates the supply ecosystem. In addition, governments must promote Internet usage by informing and training businesses and individuals.

- **All business leaders, not just e-CEOs, should put the Internet at the top of their strategic agenda.** Business leaders must optimize the benefits gleaned from the Internet through innovation and change. It is no longer a choice, given that many businesses face competitors who capitalize on the power of the Internet to innovate business models. Business leaders should play a significant role in the spread of the Internet and systematically review how the Internet allows them to innovate more aggressively and even reinvent their business models to boost growth, performance, and productivity. In particular, businesses should constantly try to identify up-and-coming Internet trends that have the potential to increase the impact of their efforts—e.g., by applying statistical analyses to the mass of data available from the Internet or using IT-enabled services to improve production capabilities.

- **All stakeholders should take part in a fact-based, public-private dialogue** to assure optimal conditions for the development of the Internet ecosystem within each country, as well as internationally. Open discussions between government and business leaders should work toward creating a nurturing environment in which the benefits of the Internet can be better understood and the Internet ecosystem can grow. Issues such as standards for digital identities and intellectual property protection must be addressed as countries strive to stimulate usage, while topics relevant to improving the supply ecosystem include net neutrality, the availability of talent, and the overall business environment.

3. Monitoring the progress of the Internet using four critical indicators

Behind our analysis and recommendations are four indicators to measure the impact and evolution of the Internet in individual countries. Two, the "e3" index and the "iGDP," focus on Internet expenditures and consumption. The other two, the McKinsey Internet Supply Leadership Index and the i4F indicator, track supply trends. Our aim is to improve and track them yearly and to review the global economy's progress toward reaping optimal economic benefits from the Internet. Also, as we know that our indicators are still imperfect, we encourage "open-source" improvements to our methodology. We've made public the details and welcome any suggestions for refining our approach.

Introduction

The Internet seems to be everywhere around us today. Yet the extent of its economic impact has been relatively unclear. Much of the economic impact of the Internet and the way that it contributes to growth and raising standards of living have gone unmeasured.

New McKinsey research has shown that the Internet not only delivers value to companies and users, it delivers astonishing value to national economies. Using an approach based on Internet-enabled consumption patterns by individuals, businesses, and governments, we found that in a broad range of countries the Internet contributes more to GDP than agriculture, energy, and several other traditional sectors do. In addition, it is a critical component of economic growth, especially in countries that embrace its utility and encourage usage at all levels.

In our study, we examined the impact of the Internet on 13 countries, accounting for more than 70 percent of global GDP: the members of the G8; Brazil, China, and India, as representative of emerging markets; and South Korea and Sweden, as countries with the most advanced broadband penetration. In addition to looking at economic impact, we developed the McKinsey Internet Supply Leadership Index and other indexes, which we calculated for each country to understand who is structuring the Internet's international landscape. The results showed economic value from the Internet beyond what most observers—even staunch Internet supporters—might suspect.

Our findings build on and go beyond earlier studies that have generally focused on one piece of the overall puzzle, for example productivity gains linked to information technologies. Our research quantifies the importance of the Internet to national economies. We also expose national differences in the Internet's impact and consider how governments should work toward building a stronger ecosystem, such as seeking ways to maximize Internet usage by individuals, businesses, and the government itself. Developing a strong Internet ecosystem requires harnessing the public's natural demand to attract talent and resources to the industry, building the necessary infrastructure, and creating an attractive business environment.

The Internet has become a significant and essential factor in national economies and, indeed, the global economy itself. As countries continue to navigate the aftermath of the global economic crisis, they must not lose sight of longer-term imperatives that could safeguard their economic health. Among other economic benefits, the Internet offers increased productivity, opportunities to expand reach into domestic and foreign markets, the means for radical product development, and the rapid deployment of game-changing ideas. Public leaders and executives who underestimate its contribution may be ignoring one of the strongest tools at their disposal.

1. The Internet is contributing strongly to wealth

The Internet has clearly grown to dazzling proportions since the 1990s, when computer networks developed by governments, businesses, and academia began to catch the public eye. Today, about 2.0 billion users worldwide, almost a third of the global population, connect to the Internet every day. Almost $8 trillion a year is spent through e-commerce (both business to business and business to consumer). In the European Union, about two-thirds of all businesses have a Web presence. Individuals, businesses, and governments have all been forever changed by the Internet.

- **Companies** keep costs down in many ways, including tapping into a broader range of suppliers for their needs and optimizing myriad processes. They have also changed the way they target customers: online marketing represents 15 percent of total marketing spending.[6] Companies are also able to bring their goods and services to markets around the world much more easily. The Internet has also enabled a new wave of business models and made possible a new type of entrepreneurship. For instance, in the United States, Internet-specific venture capital deals represent around 20 percent of total deals in terms of both numbers and investments.

- **Individuals** derive countless benefits. They compare prices. In France, the United States, and Germany, 40 percent of Internet users visit a price comparison Web site every month. They search for hard-to-find items or information (total search requests totaled more than 1 trillion in 2009).[7] They communicate and play without leaving their keyboards as new means of communication replace traditional ones. While landline and mobile voice share of the communications portfolio decreased by 7 percent between 2008 and 2010, Internet users spent 11 percent more time using social networking Web sites. They now spend as much time on social network Web sites as they do writing e-mails. The way people learn is also changing. Online video classes have allowed teachers to remove the one-size-fits-all lecture from the classroom, enabling students to learn at their own pace with online content and using class time for exercises and interactive activities. The Internet also allows teachers to follow each student individually and spot difficulties more quickly.

- **Governments** can serve citizens much more quickly and at a much lower cost with the development of e-government services such as online tax services or e-visas. In addition, a variety of government services can be delivered more cost effectively, and faster leveraging the Internet, examples range from public health and safety information to the renewal of driver's licenses.

The Internet embraces us all, and yet nobody has really measured its economic impact. The results of our study show that the Internet is already a significant contributor to the economies of the 13 countries we studied. In addition to its intrinsic weight in terms of GDP share, the Internet exerts a strong influence on economic dynamics— especially in the more mature countries—through its impact on growth, increased standards of living, and job creation. Moreover, beyond this direct contribution, the Internet has become a key contributor to the prosperity of nations through its indirect effects on traditional economy thanks to the productivity gains it offers to economic agents in all industries and all sectors, both private and public.

1.1. How we define Internet-related activities

The scope of our study includes all the activities linked to both the creation and usage of Internet networks as well as Internet services. Four types of activities are covered, and for each of those, we took the value of those activities, pro rata of their utilization of the Internet (see methodological appendix for more details):

- Web activities using Web as a support (e.g., e-commerce, content, online advertising)

- Telecommunication on IP or linked to IP communication (mainly Internet service providers)

- Software and services activities linked to Web (e.g., IT consulting, software development)

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6   MagnaGlobal, Global Ad spend by channel (including mobile), 2000–2016, 2010.
7   Comscore annual release, 2010.

- Hardware manufacturers or maintenance providers of Web-specific tools (e.g., computers, smartphones, hardware equipment, servers used for the Internet)

Internet-related activities as we define them correspond to the totality of Internet activities (e.g., e-commerce) and to a portion of the information and communication technologies (ICT) sector delineated by activities, technologies, and services linked to the Web. This definition likely underestimates the full impact of the Internet, but has the benefit of providing a consistent definition that allows for direct analysis across multiple economies. Future research will be required to more fully account for the impact.

To measure the Internet's impact on a country economy and to understand how the Internet is framed worldwide, we structured the analysis around two parts: consumption and expenditure on one hand and supply on the other (Exhibit 1).

Exhibit 1

To assess the Internet's impact on the economy, we structured the analysis around its two primary components: consumption & expenditure and supply

Internet expenditure & consumption side

For each country, private consumption, private investment, government expenditures, and trade balance (at pro-rata of Internet usage)

- Internet related services (e-commerce, content[1], and other utilization of Internet[2])
- Telecommunication related to Internet (e.g., Broadband)
- Software and services (e.g., IT consulting or software development)
- Hardware (e.g., computers, or Smartphones)

Internet supply side

Importance of a country in Internet supply ecosystem worldwide (at pro-rata of internet revenues) in

- Telecommunication[3] (e.g., Internet services providers)
- Software and services (e.g., IT consulting or software development)
- Hardware (e.g., computer, or Smartphone)

1 Content sold on the Internet (e.g., video on demand).
2 Other utilization of the Internet (e.g., administration, gambling).
3 Excluding traditional switched voice and GSM voice.
SOURCE: McKinsey analysis

On the **expenditure and consumption** side, we focused on usage by companies, governments, and individuals of the four types of activities mentioned previously. Using this approach, we are able to measure the impact of the Internet on the economy on all types of actors, including nonpure Internet players using Web technologies and deriving benefits from it.

On the **supply side**, we focused on industries that are structuring and enabling the Internet worldwide. These are grouped as telecommunications, hardware manufacturers or maintenance providers, software, and services.[8]

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8   For telecommunications, excluding traditional switched voice and GSM (Global System for Mobile Communications) voice.

1.2. Internet consumption and expenditure contributes significantly to the economy

The Internet already appears as a substantial contributor to prosperity in our sample 13 countries. Its positive impact is reflected in many aspects of the economy, including GDP, growth, employment, standards of living, and global productivity. Indeed, seven strong convictions emerge from our consumption and expenditure analysis.

The Internet is big, continues to grow and reach everywhere

Across the 13 countries of our selection, our research into the consumption and expenditure side of the equation shows that the Internet accounts for 3.4 percent of GDP, on average, based on data from 2009 (Exhibit 2). A little more than half that total—53 percent—comes from private consumption. Private investment ranked as the next-largest component, followed by public expenditures.

Exhibit 2

The Internet has a 3.4 percent share of total GDP in the 13 countries that we analyzed

	Internet contribution to GDP, 2009 $ billion	Share of total contribution %	Share of GDP %
We looked at the Internet contribution in 13 countries			
Private consumption	736	53	1.8
▪ G8 countries			
Private investment	395	29	1.0
▪ China, India, and Brazil (emerging countries)			
Public expenditure	209	15	0.5
▪ Sweden and South Korea (as they are most advanced countries in terms of broadband penetration)			
Trade balance	36	3	0.1
Total	1,376	100	**3.4 percent of GDP**

Total estimated worldwide contribution of Internet: $1,672 billion (2.9 percent of total GDP)[1]

1 For the rest of the world, we used estimated percentage shares based on Internet penetration in each country (30 percent GDP remaining).
SOURCE: McKinsey analysis

To compute the weight of Internet in the GDP, we used the expenditure approach and relied on four major components (see methodological appendix for more details).

▪ **Private consumption.** This is the total consumption of goods and services by consumers via the Internet or needed to obtain Internet access, including electronic equipment, e-commerce, broadband subscriptions by individuals, mobile Internet market, hardware and software consumption, and smartphone consumption prorated for Internet usage. Private consumption from the Internet is driven primarily by online purchases of goods and services. In the United States, for example, Web surfers made purchases worth $250 billion in 2009,[9] with the average buyer spending about $1,773 over the year. In the United Kingdom, every online buyer purchased, on average, $2,535 worth of goods and services in 2009,

9 For retail, Forrester online retail forecast, 2010, for travel PhoCusWright's, Online travel overview, 2010, for gambling, H2 Gambling Capital Consultants, online gambling, 2010.

making it one of the countries where e-commerce is the most developed (see Box 1, "How the United Kingdom benefits from online shopping").

■ **Private investment.** Private-sector investment in Internet-related technologies (telecoms, extranet, intranet, Web sites, etc.), accounts for 29 percent of the Internet's total contribution to GDP.

Box 1. How the United Kingdom benefits from online shopping

To the surprise of many—except perhaps online retailers active in Britain—residents of the United Kingdom are avid online shoppers, ringing the virtual till far more often than their US cousins or their French neighbors. In 2009, online shoppers in the United Kingdom bought, on average, $2,535 worth of goods and services ($1,016 per capita in the country), or 1.4 times the amount of the average US online shopper and 1.8 times that of the average French shopper.

Our research shows that it's not that more people in Britain use the Internet or that more shop on the Internet. In both categories, the United Kingdom is in the middle, with the United States leading and France third. British shoppers simply ring up more purchases, totaling $1,016 per capita in 2009 and accounting for $63 billion or 2.9 percent of GDP.[1] US shoppers bought just $814 in goods and services per capita in 2009 ($250 billion or 1.8 percent of GDP) and French shoppers $555 ($35 billion or 1.3 percent of GDP).[2]

Looking behind the aggregate numbers, a primary difference behind these differences in contribution to GDP comes directly from the structure of the economy itself, with the United States boasting a higher per capita GDP than the United Kingdom or France. But another critical difference is the amount British online shoppers spend on travel and groceries leading to larger online baskets. UK residents generally spend about 25 percent more on travel than those in United States, and the pattern continues online. British shoppers spent on average $1,067 on travel in 2009, compared $717 for French shoppers and $631 for US shoppers. In addition, online grocery shopping is much better established in Britain than the other countries. In the United Kingdom, the average online shopper bought $228 in groceries in 2009, compared with $79 in France and $33 in the United States, in part because Tesco embraced the Internet very early in the United Kingdom.

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1   For retail, Forrester online retail forecast, 2010, for travel PhoCusWright's, Online travel overview, 2010, for gambling, H2 Gambling Capital Consultants, online gambling, 2010.
2   Fédération e-commerce et vente à distance annual release, 2010.

■ **Public expenditure.** Public expenditure accounts for 15 percent of total Internet weight in GDP and includes Internet spending for consumption and investment by the government (software, hardware, services, and telecoms) at pro rata of Internet.

■ **Trade balance.** This is exports of goods, services, and Internet equipment, plus B2C and B2B e-commerce, from which were deducted all associated imports.

On average, our research showed that the Internet has a greater weight in the economies that we analyzed than agriculture, utilities, and other better-established industries. In addition, the Internet was already more than half as powerful in terms of economic contribution as such major sectors as health care and financial services (Exhibit 3).

Internet-related consumption and expenditure worldwide in 2009 was larger than the GDP of Canada or Spain and growing faster than Brazil.

Exhibit 3

If Internet were a sector, it would have a greater weight in GDP than agriculture or utilities
Sector contribution to GDP
% of total GDP, 2009

Real estate	11.0
Financial services	6.4
Health care	6.3
Construction	5.4
Discrete manufacturing	5.2
Transportation	3.9
Education	3.0
Communication	3.0
Agriculture	2.2
Utilities	2.1
Mining	1.7
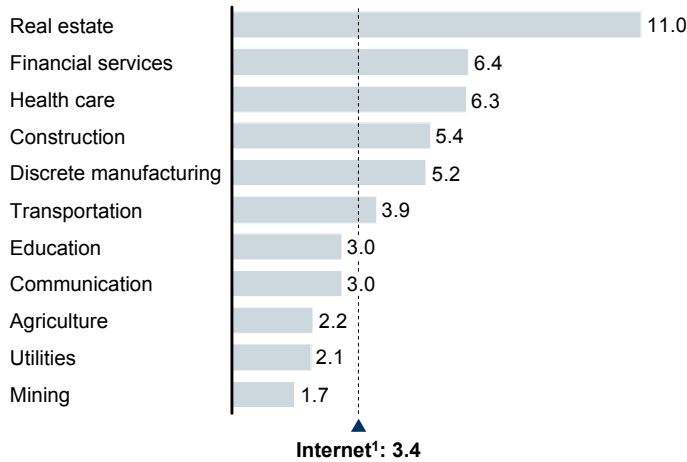
Internet[1]: 3.4

1 Internet share includes parts of other sectors (e.g., communication).
SOURCE: Organisation for Economic Cooperation and Development; McKinsey analysis

Internet is still in its infancy in global terms.

The Internet's economic impact varies widely even among countries at the same stage of development. While the Internet has reached around 6 percent of GDP in the most advanced countries like Sweden and the United Kingdom, nine out of the 13 countries are below 4 percent, leaving tremendous room for further Internet development. Within our sample group of 13 countries, the Internet's share of GDP ranges from 0.8 percent in Russia to 6.3 percent in Web-savvy Sweden (Exhibit 4).

In every country except China and India, private consumption accounted for about half or more of the contribution, peaking at 69 percent of the total in South Korea or more than 70 percent in Brazil and Russia. In China and India, however, the impact of the Internet was powered by a strong trade balance, with net foreign trade making up 39 and 47 percent, respectively, of the total economic contribution from the Internet. Public expenditures on the Internet ranged widely from 5 percent of the total GDP contribution in India to more than 20 percent in the United Kingdom, United States, Brazil, and Russia.

Exhibit 4

Internet contributed directly to between 0.8 percent and 6.3 percent of GDP, depending on the country

Contribution to GDP, 2009

- ■ Private consumption
- ■ Private investment
- ■ Public expenditure
- ▫ Trade balance

Internet contribution to country GDP

Percent of total Internet contribution to GDP

Country	Trade balance (neg)	Private consumption	Private investment	Public expenditure	Trade balance (pos)	Internet contribution to country GDP
Sweden		46	26	11	17	**6.3**
United Kingdom	-3	58	25	20		**5.4**
South Korea	-8	69	31		8	**4.6**
Japan	-4	47	45	12		**4.0**
United States	-4	60	24	20		**3.8**
Germany		53	27	13	7	**3.2**
India		20	28	5	47	**3.2**
France	-2	55	35	12		**3.1**
Canada		61	19	17	3	**2.7**
China		32	23	6	39	**2.6**
Italy	-9	56	36	17		**1.7**
Brazil	-8	73	15	20		**1.5**
Russia	-32	74	33			**0.8**

25

SOURCE: McKinsey analysis

The Internet generates growth

Our analysis further shows that the Internet has been a major driver to economic growth and is getting stronger. Over the past 15 years, the Internet accounted for 7 percent of our 13 countries' combined economic growth. Its influence is expanding. Looking at the past five years, the contribution to GDP growth reaches 11 percent. When we look at mature countries, we see that the Internet contributed 10 percent of their growth over the past 15 years and doubled to 21 percent in the past five years. In the United Kingdom, which mirrors the typical experience of a mature country, the Internet contributed 11 percent to the country's growth rate over the past 15 years and 23 percent over the past five years (Exhibit 5).

These results are reflected at a microeconomic level where the evidence is abundantly clear that Internet usage triggers a significant increase in performance in businesses at all levels and particularly among SMEs and other entrepreneurial endeavors. We surveyed more than 4,800 SMEs in 12 countries (our study group excluding Brazil) and found that those utilizing Web technologies grew more than twice as fast as those with a minimal presence (Exhibit 6). The results hold across all sectors of the economy. Further, Web-savvy SMEs brought in more than twice as much revenue through exports as a percentage of total sales than those that used the Internet sparingly. These Web-knowledgeable enterprises also created more than twice the jobs as companies that are not heavy users of the Internet (see Box 2, "SMEs capture a broad range of advantages"). When we look closely at individual sectors, we see that this is true across

sectors from retail to manufacturing. Manufacturing is one of the sectors enjoying most impact from Internet.

On average, the survey showed that the Internet enabled a 10 percent increase in profitability across countries. The impact on profits came half from increased revenues, and half from lower costs of goods sold and lower administrative costs.

Exhibit 5

The Internet contribution to GDP growth has been an average 21 percent in mature countries over the past five years

		Internet contribution to GDP growth %		Nominal GDP growth, 1995–2009 Local currency
		1995–2009	2004–09	
Mature countries	Sweden	15	33	3.9
	Germany	14	24	1.9
	United Kingdom	11	23	4.7
	France[1]	10	18	3.4
	United States	8	15	4.7
	South Korea	7	16	7.0
	Canada	6	10	4.6
	Italy	4	12	3.4
	Japan[2]	0	0	-0.3
Average, mature countries		10	21	
	India	4	5	13.1
	China	3	3	9.5
	Brazil	2	2	10.7
	Russia	1	1	26.7
Average, high-growth countries		3	3	
Average, 13 countries		7	11	

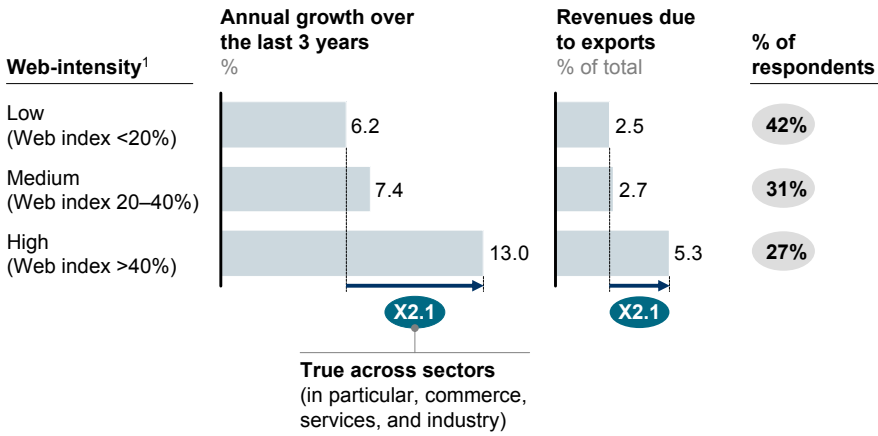1 For France, the Internet contribution to growth from 2009–10 was 25 percent.
2 Negative growth due to deflation.
SOURCE: National accounts, Organisation for Economic Cooperation and Development; McKinsey analysis

Exhibit 6

Small and medium-sized enterprises using Web technologies extensively are growing more quickly and exporting more widely

Growth and exports of SMEs analyzed by cluster of maturity of Internet
Analysis includes 12 countries and more than 4,800 SMEs

Web-intensity[1]	Annual growth over the last 3 years %	Revenues due to exports % of total	% of respondents
Low (Web index <20%)	6.2	2.5	42%
Medium (Web index 20–40%)	7.4	2.7	31%
High (Web index >40%)	13.0	5.3	27%

X2.1   X2.1

True across sectors
(in particular, commerce, services, and industry)

1 McKinsey Web index defined according to the number of technologies possessed by companies and the penetration of those technologies (i.e., the number of employees/ customers or suppliers having access to those technologies).
SOURCE: McKinsey SME Survey

Box 2. SMEs capture a broad range of advantages

Accelerated growth and a more accessible export market are just two of the many advantages the Internet brings to SMEs that invest in a substantial Web presence.

We produced an index reflecting the penetration and usage of Internet technologies, called the SME Internet Maturity Index. This index shows penetration of Internet technology and its usage by employees, clients, and suppliers. On the basis of the Index, we placed each of the companies in our sample into one of three categories: low Web intensity, medium Web intensity, and high Web intensity.

Our survey of more than 4,800 SMEs in 12 countries showed that on average, companies using Internet with a high intensity grow twice as quickly as low-Web-intensity companies, export twice as much as they do, and create more than twice as many jobs.

In addition—and not surprisingly—we found that countries where a greater proportion of SMEs have a strong presence on the Internet are also those with a greater contribution from the Internet to the national economy. For example, in the United Kingdom our survey showed that about 71 percent of the SMEs use the Internet with high or medium intensity, and our analysis concluded that the Internet contributes about 5.4 percent to the British GDP. In Russia, on the other hand, only about 41 percent of SMEs have high or medium Internet engagement, and the Internet contributes about 0.8 percent to the Russian GDP.

Internet maturity correlates with a rising standard of living

Leveraging endogenous growth theory, we were able to assess the Web's impact on per capita GDP increase within the countries surveyed. The analysis showed a clear correlation between per capita GDP growth and a country's Internet maturity based on its e3 index.

We developed the e3 index to reflect Internet maturity of a country, measuring **e-ngagement, e-nvironment,** and **e-xpenditure**, which are themselves largely based on numbers provided by the World Economic Forum and OECD. Weighing these three components, the e3 index represents the depth of a country's maturity in access infrastructure and Internet usage by individuals, businesses, and governments. Scandinavian and North American countries, three north European countries (the Netherlands, Switzerland, and the United Kingdom), and South Korea capture the top ten positions in our e3 rankings.

A positive correlation has been established in the past between broadband penetration and per capita GDP growth. However, for the first time, to our knowledge, using the e3 index as an indicator of Internet maturity, we have been able to show statistically that the Internet correlates positively with net per capita GDP growth and therefore to increasing standards of living in the countries we examined. Our e3 index also correlates with labor productivity growth. Another regression we ran, based on the total Internet expenses of individuals, businesses, and government in a country, shows the same result (see Box 3, "Statistical approach"). Combined with very strong statistical evidence, these two regressions clearly show that use of the Internet correlates with higher growth in both per capita GDP and labor productivity.

Using the results of these correlations, a simulation shows the Internet has enabled an increase in real per capita GDP of $500 on average in mature countries over the last 15 years. The Industrial Revolution took 50 years to achieve the same result.[10] This analysis shows both the magnitude of the positive impact of the Web at all levels of society and the speed of the benefits it brings.

Of course, these are just correlations. Causality still needs to be fully proved and we welcome additional work in this field.

Our conclusions are consistent with earlier academic studies that explored the Internet's impact on economies. For example, a 2003 study at Myongji University in South Korea examined 207 countries and found Internet penetration has a positive impact on economic growth.[11] A more recent study by professors at the University of Munich in 2009 found a clear path from the introduction of broadband and its increased penetration to per capita GDP, concluding that every 10-percentage-point increase in broadband penetration adds 0.9 to 1.5 percentage points to per capita GDP growth.[12]

10 Angus Maddison, *The World Economy: Historical Statistics,* Paris: OECD, 2003.

11 Changkyu Choi and Myung Hoon Yi, *The effect of the Internet on economic growth: Evidence from cross-country panel data,* 2003.

12 Nina Czernich, Olivier Falck, Tobias Kretzchmer, and Ludger Woessmann, *Broadband infrastructure and economic growth,* CESIFO working paper, December 2009.

Box 3. Statistical approach

To complete our bottom-up analysis of the contribution of the Internet to GDP based on the expenditure approach, we used statistical analysis to correlate the evolution of Internet economy with per capita GDP in a given country.

The analysis was based on three main rationales:

- Confirm, using econometrical analysis, our first macroeconomic methodology on the contribution of the Internet to GDP growth.

- Isolate the net contribution of the Internet from the substitutive effect between the Internet and non-Internet spending (e.g., e-commerce) that could have been included in our contribution of the Internet to GDP.

- Determine the spillover effect from the Internet economy to the non-Internet economy. Some spillover, for instance, could be retail purchases that result from online price comparisons and searches, while many free services bundled with access contracts, such as e-mail, are driving some amount of economic productivity.

We ran two regressions to determine the net link between growth and Internet usage.

Methodology

The model relies on economic growth theory and extends a total factor productivity growth equation with Internet-specific data used as an additional factor of production.

Assuming a macroeconomic function between per capita GDP and input of production of Cobb-Douglas:

$$Y = AK^aL^b$$

where Y is the per capita GDP, A is the state of technology, K is physical capital per capita, and L is human capital.

Assuming that A is a combination of Internet contribution and a fixed effect, we can write growth of per capita GDP as a linear combination between Internet usage, physical capital growth, and human capital growth:

- As a measure of growth, we used real per capita GDP growth (in 2005 US dollars) provided by the World Bank database.

- As a measure of Internet use in a country, we used our McKinsey e3 index, which indicates Internet maturity.

- For measuring contribution of capital and labor, we used growth of fixed capital per capita (in 2005 US dollars) and growth of labor per capita, both provided by the World Bank database.

- We also applied controlling variables, such as lagged level of per capita GDP 2005 and dummy variable per years.

The second regression replaces the e3 index with total Internet expenses in each country,[1] leveraging endogenous growth theory and using Internet-related ICT as an extra factor of production in Cobb-Douglas equation.

We examined nine countries (the 13 countries is our study sample, excluding China, Brazil, India, and Russia, where some data were unavailable) and five years for regression for a total of 45 data points.

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1   ICT expenses given by Gartner each year to which we apply Internet ratios to derive Internet expenses.

Box 3. Statistical approach (continued)

Findings

Both equations provide the same magnitude of impact of the Internet to GDP and show positive correlation between per capita GDP growth and Internet maturity of a country:

The first regression gives results statistically significant, with an R square of 89 percent and a Tstat of 2.3 for the contribution of e3 to growth. Statistical contribution of e3 to growth is evaluated at 2.6 percent. This would mean that an increase of 10 points of e3 would result in an increase of real per capita GDP growth of 0.26 percentage point.

The second regression gives the same statistically significant results with an R square of 91 percent and Tstat = 3.2 for the contribution of Internet expenses to per capita GDP growth. For every 10 percent increase in Internet expenses, real per capita GDP grows an additional 1.2 percentage point.

When comparing this statistical approach with a macroeconomic approach, we see that the two approaches converge and show that the Internet creates net value to an economy through GDP growth.

However, we see some differences between the two approaches at the country level:

In some countries (e.g., South Korea and Sweden) the statistical contribution of the Internet to growth is lower than under the macroeconomic approach, showing a substitutive effect of e-commerce.

In some countries (e.g., Canada and the United States) the statistical contribution to growth is higher than under the macroeconomic approach, showing strong spillover effects on the non-Internet economy.

The Internet creates jobs

Common wisdom tends to consider that the Web has a negative or neutral impact on employment. This is derived from the idea that the Internet has favored massive disintermediation. But this is a misconception. As we have demonstrated, the Internet is a contributor to net job creation in the sample countries. While some jobs have been destroyed by the emergence of the Internet, many more have been created during the same period, including jobs directly linked to the Internet such as software engineers and online marketers as well as more traditional jobs, for example in logistics to deliver online purchases.

A detailed analysis of France over the past 15 years shows that the Internet created 1.2 million jobs and destroyed 500 000 jobs, creating a net 700,000 jobs or 2.4 jobs for every one destroyed. This result is also reflected in our survey of more than 4,800 SMEs in the countries we studied, which shows that 2.6 jobs were created for every one destroyed, confirming the Internet's capacity for creating jobs across all sectors. Further, companies that have fully integrated the technology and use it extensively create more than twice as many jobs as the average, while the Internet has a neutral to slightly negative effect on companies using it only sparingly or not at all.

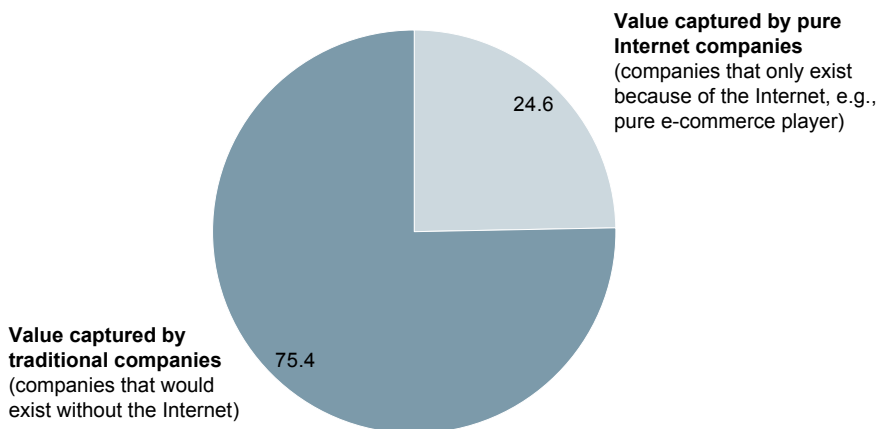**The Internet is a modernization factor for the whole economy**

Although the Internet has resulted in significant value shifts between sectors in the economy, our study demonstrates that all industries have benefited from the Web.

Perhaps surprisingly, the vast majority of the economic value created by the Internet is derived from industries not directly linked to ICT. About 75 percent of the economic impact of the Internet is happening at companies in more traditional industries that have witnessed significant productivity increases (Exhibit 7). SMEs in particular obtain a strong boost from using the Internet.

Exhibit 7

Traditional industries capture 75 percent of the value of the Internet

Share of Internet profitability gain between companies
100% = Total Internet value for all companies

Value captured by pure Internet companies (companies that only exist because of the Internet, e.g., pure e-commerce player)

24.6

Value captured by traditional companies (companies that would exist without the Internet)

75.4

SOURCE: McKinsey SME Survey

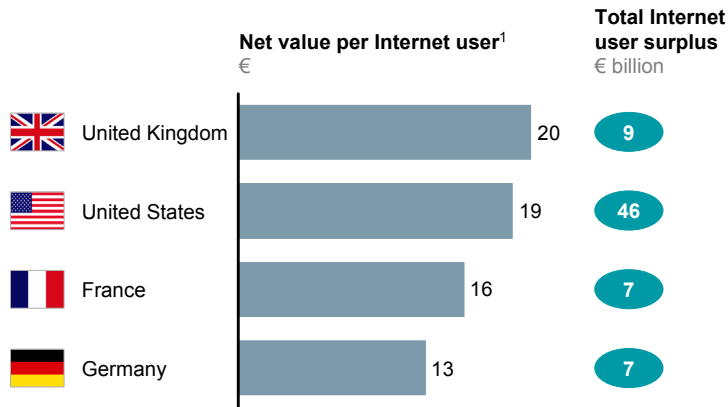### The Internet goes beyond GDP, generating consumer surplus

The Internet has changed our lives, giving us access to a large set of free services from e-mail and browsing to information services and search, or collaborative services such as wikis, blogs, and social networks. This access has given users substantial surplus value beyond the impact of the Internet on GDP. Our research shows that this value ranges from €13 ($18) a month per user in Germany to €20 ($28) in the United Kingdom (Exhibit 8). All told, the Internet generated substantial annual consumer surpluses, from €7 billion ($10 billion) in France to €46 billion ($64 billion) in the United States.

In general, this surplus is generated from the exceptional value users place on Internet services such as e-mail, social networks, search facilities, and online reservation services, among many others. This value far outweighs the costs, both actual costs such as access and subscription fees and annoyances such as spam, excessive advertising, and the need to disclose personal data for some services. In the United States, for example, research conducted with the Interactive Advertising Board[13] found that consumers placed a value of almost €61 billion on the services they got from the Internet, while they would pay about €15 billion to get rid of the annoyances, suggesting a net consumer surplus of about €46 billion.

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13   Internet Advertising Board, *Assessing the consumer benefits of online advertising,* July 2010.

Exhibit 8

The value of the surplus accruing to users of the Internet varies between €13 and €20 per user per month in each country

Net value per Internet user[1]
€

Total Internet user surplus
€ billion

		Net value per Internet user	Total Internet user surplus
🇬🇧	United Kingdom	20	9
🇺🇸	United States	19	46
🇫🇷	France	16	7
🇩🇪	Germany	13	7

1 All in the same currency based on Organisation for Economic Cooperation and Development exchange rates.
SOURCE: McKinsey study (with Internet Advisory Board); Yankee; McKinsey analysis

1.3. While countries with a high Internet contribution to GDP tend to have a strong Internet supply ecosystem, the Internet supply landscape offers contrasts

Along with the Internet's economic contribution within the countries in our study sample, we also examined supply, looking at the participation of each country in the framing of the global Internet ecosystem. To do this, we crafted the McKinsey Internet Supply Leadership Index, based on four subindexes (Exhibit 9):

- **Importance index,** measuring the country's overall contribution to the global ecosystem

- **Performance index,** measuring the profitability of a country in the Internet ecosystem

- **Growth index,** measuring the growth of the country in the Internet ecosystem

- **Preparation for the future,** measuring how well a country prepares for the future (e.g., in anticipating forthcoming trends and making R&D investments accordingly)

The McKinsey Internet Leadership Supply Index is the average of each subindex, while each subindex is the average of its components. The score for the leading country in each subindex is set at 100, and the scores for the other countries are based on their positions relative to the leader.

The United States leads the global Internet supply ecosystem mainly because of its importance within the system

Unsurprisingly, the United States leads the McKinsey Internet Supply Leadership Index with an overall score of 58, almost 40 percent higher than that for Sweden, the next-closest country (Exhibit 10).

Exhibit 9

To understand the importance of an individual country to the Internet supply ecosystem worldwide, we built the McKinsey Internet leadership supply index using four indicators

McKinsey Internet leadership supply index[1]			
Importance	**Performance**	**Growth**	**Preparation for the future**
▪ Share by country of top 250 Internet-related firms' revenue where their headquarters is located ▪ Share by country of gross Internet-related[2] GDP output	▪ Gross operating surplus[3] for Internet-related[2] activities per capita by country ▪ Net income of top 250 Internet-related firms by FTE ▪ Net income as % of revenues of top 250 Internet-related firms ▪ Dividends distributed by ICT/Internet-related companies in the top 250 Internet-related firms	▪ 2000-09 growth of top 250 Internet-related companies per country	▪ Number of Internet-related patents per capita between 2000–07 ▪ R&D expenses related to Internet per capita ▪ Publications related to Internet per capita in the last 10 years

1 Non-weighted average of all sub-indexes.
2 Computer and related activities, office, accounting and computing machinery, and post and telecommunication.
3 Organisation for Economic Cooperation and Development denomination.
SOURCE: McKinsey analysis

Exhibit 10

The United States leads the Internet supply ecosystem
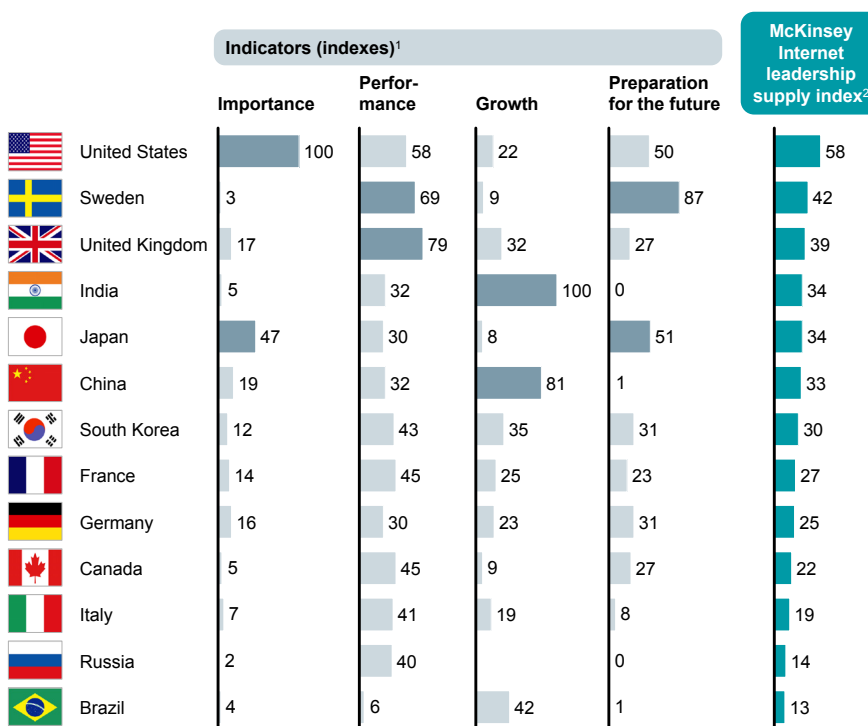
	Indicators (indexes)[1]				McKinsey Internet leadership supply index[2]
	Importance	**Performance**	**Growth**	**Preparation for the future**	
United States	100	58	22	50	58
Sweden	3	69	9	87	42
United Kingdom	17	79	32	27	39
India	5	32	100	0	34
Japan	47	30	8	51	34
China	19	32	81	1	33
South Korea	12	43	35	31	30
France	14	45	25	23	27
Germany	16	30	23	31	25
Canada	5	45	9	27	22
Italy	7	41	19	8	19
Russia	2	40	0	0	14
Brazil	4	6	42	1	13

1 Each index is the average of component sub-indexes. See appendix for detail on sub-indexes.
2 Arithmetic mean of the four indicators.
SOURCE: Organisation for Economic Cooperation and Development; McKinsey Internet-related top 250 firm database; McKinsey analysis

The United States' leading position rests primarily on its economic importance within the system, where it scores more than twice as high as Japan, which ranked second on importance. For example, in measuring importance, we noted that from among the 13 countries in our study, 38 percent of the production needed to build the Internet—hardware, software, and content—originated in the United States, compared to 14 percent from Japan and 10 percent from China. In addition, US companies captured 35 percent of the total Internet revenues earned by the global top 250 Internet-related companies, followed by Japan with 20 percent.

Part of the explanation for this leadership may be the United States' mixed structure among the ICT industries. US companies in the top 250 Internet-related companies are spread over all the Internet-related supply domains: 42 percent of revenues are hardware, 26 percent are software and services revenues, and 30 percent are telecoms revenues (see methodological appendix on McKinsey Internet Supply Leadership Index for more details).

Other components of the McKinsey Internet Supply Leadership Index highlight the role played by other countries.

- **The United Kingdom and Sweden companies show the best performance.** In the performance portion, the United Kingdom and Sweden rank first and second, respectively, with the United Kingdom strong in per capita gross income from Internet-related companies and in net income per employee in these industries and Sweden ahead in dividends paid per capita. This is mainly because of the strong performance and importance of their telecoms operators. Indeed, telecommunications companies in European countries generally exhibit strong performance. For instance, in France, telecoms account for about 60 percent of all Internet revenues and in the United Kingdom, 87 percent.

- **With high-growth companies, India and China are catching up fast.** India is leading in the growth component with China second, followed closely by Brazil and South Korea, while Japan is near the bottom of the growth rankings. A critical difference appears to be Japan's inability to monetize its research and development expenditures, while companies in the leading countries have done better at turning ideas into revenue.

- **Japan and Sweden are investing in the future, but other players are rapidly emerging.** Innovation is important in Japan and Sweden. Each country has strong R&D investments and a high number of patents per capita.

Change could come swiftly. As the world has become more wired, developing an Internet ecosystem has taken less and less time. For example, in the 1970s and 1980s it took Israel about 14 years to grow from 50 to 200 new patents a year. Starting in the mid-1990s, it took Singapore about six years to cross this threshold, and most recently the Indian city of Bangalore crossed it in just four years.

We also see an Internet ecosystem that offers contrasts (Exhibit 11). The United States is well ahead in our index, collecting fair contributions to GDP from the Internet and enjoying strong growth in these industries. The United Kingdom and Sweden are also strong performers, very much focused on telecommunications. Canada, France, and Germany could take better advantage of their high Internet usage to gain prominence on the supply side. The developing countries we studied—Brazil, China, and India—are growing quickly, as is South Korea, while Japan is having difficulty capitalizing on its relatively high importance to the Internet supply ecosystem because of performance challenges.

Exhibit 11

Countries with a high Internet contribution to GDP correlate to those with a strong Internet supply ecosystem

Growth >10%

- United Kingdom and Sweden are very strong performers
- Telecoms are driving high contribution

Internet contribution to GDP
%

- Similar hardware-driven profiles: South Korea is growing fast and Japan is capturing high proportion of Internet/ICT supply but is decelerating mainly due to low performance

- The United States is capturing ~40% of Internet/ICT share
- Lower consumption of Internet by individuals and higher per capita GDP generate lower contribution than in the United Kingdom or Sweden

No country with strong ecosystem and low Internet consumption

McKinsey Internet ecosystem supply index

- France, Germany, and Canada should leverage strong usage to participate more in the supply side
- China and India fast catching up both in terms of GDP contribution and supply ecosystem, followed by Brazil with strong growth

SOURCE: McKinsey analysis

A detailed look at consumption and supply tells the same story. Beneath the flashy successes of Google, Facebook, eBay, and other megasites and bolstered by uncounted smaller efforts, the Internet has become a sizable contributor to national economies, giving economic growth a much larger push than most observers might guess.

1.4. Public and private should focus on four critical areas to build a strong supply ecosystem
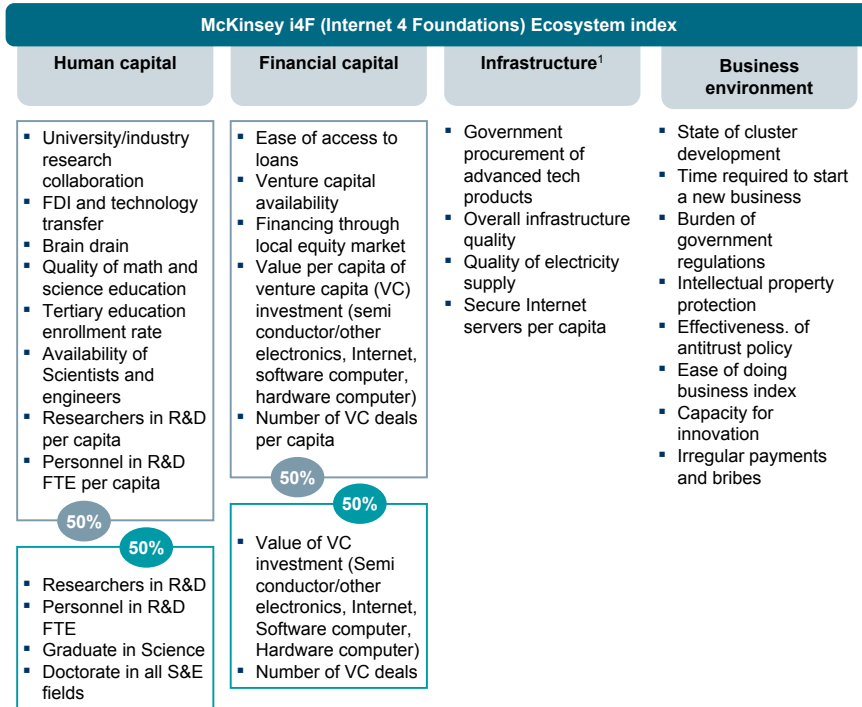
To develop a strong Internet ecosystem, public and private attention must be focused on supply and in particular on four areas critical to the development of the network. Infrastructure is obvious and usually receives the bulk of public and private investment, but the other areas—human capital, financial capital, and the business environment—are also important components of a healthy and vibrant system. The McKinsey i4F (Internet 4 Foundations) index (see Exhibit 12) takes these areas into account.

Countries such as Sweden and the United States that rank high across the board (Exhibit 13) are also the ones that generate the most value from the Internet. Indeed, we see a correlation between Internet i4F indicator and Internet McKinsey Supply Leadership Index showing how important it is for a country wishing to build a strong Internet ecosystem to focus on these four areas (Exhibit 14).

Exhibit 12

We built a McKinsey i4F index to gauge the capacity of individual countries on the four foundations of the Internet

☐ Quality drivers
☐ Quantity drivers

McKinsey i4F (Internet 4 Foundations) Ecosystem index

Human capital	Financial capital	Infrastructure[1]	Business environment

Human capital
- University/industry research collaboration
- FDI and technology transfer
- Brain drain
- Quality of math and science education
- Tertiary education enrollment rate
- Availability of Scientists and engineers
- Researchers in R&D per capita
- Personnel in R&D FTE per capita

50%

50%
- Researchers in R&D
- Personnel in R&D FTE
- Graduate in Science
- Doctorate in all S&E fields

Financial capital
- Ease of access to loans
- Venture capital availability
- Financing through local equity market
- Value per capita of venture capita (VC) investment (semi conductor/other electronics, Internet, software computer, hardware computer)
- Number of VC deals per capita

50%

50%
- Value of VC investment (Semi conductor/other electronics, Internet, Software computer, Hardware computer)
- Number of VC deals

Infrastructure[1]
- Government procurement of advanced tech products
- Overall infrastructure quality
- Quality of electricity supply
- Secure Internet servers per capita

Business environment
- State of cluster development
- Time required to start a new business
- Burden of government regulations
- Intellectual property protection
- Effectiveness. of antitrust policy
- Ease of doing business index
- Capacity for innovation
- Irregular payments and bribes

1 Infrastructure is viewed as being a "threshold" factor where increases above a certain threshold do not confer additional advantage. All ratings above 60 (our defined threshold) are set to 60.

SOURCE: World Economic Forum; United Nations Educational, Scientific and Cultural Organization; Venture Expert; International Institute for Management Development; World Bank; McKinsey analysis

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- **Human capital has been a clear advantage for the United States.** The United States has historically produced and attracted a large quality and quantity of trained professionals to provide the talent required by its Internet ecosystem.

  — Focusing on education: The breadth and depth of education, particularly in math and sciences, is among the key indicators in this area. The United States, which ranked highest on this indicator, is home to some of the world's top universities, attracting high-potential domestic and foreign scholars. For example, 43 percent of all doctoral candidates in US science and engineering programs are foreign students brought to the country by the strong reputations of its universities, a scholastic marketing program targeting foreign students, opportunities to earn high salaries, and administrative processes that ease their integration into the programs. In Sweden, the government has started several initiatives to increase the number of highly-qualified ICT graduates, including a program that provided IT training to 75,000 primary and elementary school teachers, who then brought these skills to students at all levels. The Swedish government also increased the capacity of university science and engineering programs, allowing a 7 percent increase in graduate students studying science between 1998 and 2004, and helped to finance new positions in the Royal Institute of Technology. However, even the US now faces potential shortfalls in creating the talent needed in the STEM (Science Technology Engineering and Mathematics) disciplines that are critical to the Internet ecosystem.

Exhibit 13

## The United States and Sweden are outperforming the McKinsey i4F index

	Indicators (indexes)[1]				McKinsey i4F Internet ecosystem index[2]
	Human capital	Financial capital	Infra-structure[3]	Business environment	
United States	83	84	60	76	76
Sweden	54	41	60	92	62
Japan	59	17	60	83	55
Canada	55	26	60	81	55
United Kingdom	53	26	60	75	54
Germany	49	17	60	79	51
France	47	26	60	72	51
South Korea	53	34	60	56	51
China	53	20	46	64	46
Russia	47	26	31	29	33
India	31	21	26	51	32
Italy	27	10	37	51	31
Brazil	24	14	39	34	28

1 Each index is the average of component sub-indexes. See appendix for detail on sub-indexes.
2 Arithmetic mean of the four indicators.
3 Infrastructure is viewed as being a "threshold" factor where increases above a certain threshold do not confer additional advantage. All ratings above 60 (our defined threshold) are set to 60.

SOURCE: Organisation for Economic Cooperation and Development; McKinsey Internet-related top 250 firm database; McKinsey analysis

Exhibit 14

The correlation between our i4F and supply indexes shows that a favorable environment enables a strong performance in Internet supply

Correlation between i4F index and McKinsey supply index, 2009
%

McKinsey supply index

R^2 = 63% (89% without India and Canada)[1]

McKinsey i4F index
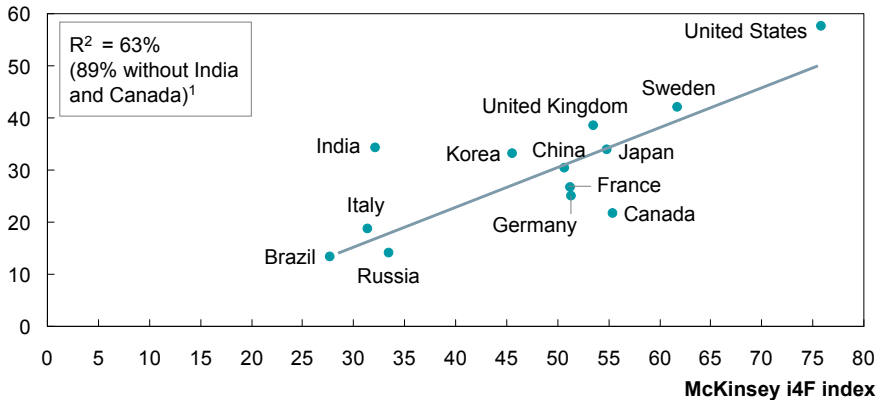
1 Canada: Low score mainly due to Nortel collapse. India: High McKinsey supply leadership index mainly due to Bangalore and not whole India.

SOURCE: World Economic Forum; United Nations Educational, Scientific and Cultural Organization; Venture Expert; International Institute for Management Development; World Bank; McKinsey analysis

— Bringing in talent: Countries also deepen their talent pools by bringing in skilled workers from abroad. For example, compared to other countries, US immigration policy has historically created a favorable climate for attracting ICT foreign workers, allowing employment visas to be distributed based on employment and educational qualifications and for employers to sponsor incoming employees. And the Internet ecosystem has been a disproportionate beneficiary of these policies. In 2003, for example, 40 percent of H-1B nonimmigrant visas were granted to ICT workers.

— Creating technological clusters: Technology clusters can create a virtuous cycle for the creation and attraction of talent–examples include Silicon Valley in the United States and Bangalore in India. Some technology clusters have emerged naturally, while others have benefited from proactive policies and private-public partnerships. For example, to increase the number of high qualified ICT graduates, Sweden developed a research center in new technologies. However, the success record of setting up technology clusters has been mixed and many of the lessons learned well documented.

— Diversifying the employer landscape: Countries benefit by bringing in foreign multinationals that help build human capital through knowledge and technological exchanges.

- **Efficient access to financial capital has helped many countries gain prominence in the Internet ecosystem.** Access to appropriate funding— through loans, venture capital investments, or other means—gives SMEs and other entrepreneurial efforts a chance to compete with their ideas in the market. Countries that launched incentives to promote financing both from traditional sources such as banks or self-investment and from investors with a more specialized approach, such as venture capital funds, are performing well on our index.

— Promoting private investment: The United States, for example, launched financing mechanisms targeted at supporting the growth of technology firms. One of these programs, created in 1990, was the Advanced Technology Program, which was designed to organize cofinancing between public and private sources for high-risk research and development projects. Between 1990 and 2004, the program led to the funding of $576 million in electronics projects and $504 million in ICT projects. South Korea offered loan incentives to promote investment in carrier infrastructure and has encouraged significant investment in local research and development, resulting in a 9 percent annual increase in investment between 1997 and 2007.

— Encouraging Internet-focused venture capital: For example, Israel, though not in our study sample, famously advanced its IT sector about 20 years ago by creating alliances with Silicon Valley venture capitalists, who today have access to the country's superior ICT R&D. In East London, a technology ecosystem is being developed with the involvement of 60 venture capital firms specializing in new technology are 21 specialize in technology.

- **Infrastructure investment is essential, and most developed countries have already created an efficient Internet infrastructure.** Investment in the supply infrastructure goes well beyond plugging the Internet into everyone's homes, although that is obviously a critical component. Infrastructure is the essential backbone for the entire ecosystem. It creates the platform upon which users, and organizations experience the Internet, and upon which entrepreneurs and businesses innovate. Using research we conducted with the World Economic Forum—the "Innovative Heatmap"—we established a threshold in our index.[14] Once

14   McKinsey's Innovation Heatmap partnership with the World Economic Forum.

countries pass this quality and penetration milepost—as most developed countries have—infrastructure is no longer a differentiating component.

— Facilitating deployment of infrastructure by the private sector: In Japan, for example, the development of a fiberoptic network by private telecommunications players has been encouraged in several ways, and by 2007 the penetration of the fiberoptic networks rivaled that of the DSL network, 40 percent and 46 percent, respectively. Some of the policies applied included: tax incentives such as tax reductions on assets and favorable income tax rates; advantageous credit facilities such as government-guaranteed credit for private telecommunications companies, enabling them to access to lower finance costs, and more leverage while building the country's Internet infrastructure; and market deregulation, which created competition in the telecommunications market, leading the incumbent, NTT, to invest in a fiberoptic network.

— Direct public investment in infrastructure, especially in areas with limited profitability: The Swedish government, for example, has promised Internet access to everyone and backed this with a €570 million project to bring broadband to low-density areas.

- **Creating the right business environment is critical.** An attractive business environment can accelerate the growth of a vibrant Internet ecosystem, while the wrong environment could stifle growth. A wide range of factors from tax incentives and the level of corruption to encouragement of innovation work together to create a nurturing environment for developing an Internet ecosystem.

    — Promoting deregulation: Deregulation often brings increased competition, which can motivate established companies to increase their investments or push for greater innovation. In the United States, deregulation triggered a series of new offers from incumbents AT&T and Verizon, while in Japan NTT moved forward with building a fiberoptic network.

    — Creating an appropriate legal framework: Protecting intellectual property rights and strengthening antipiracy laws, as South Korea did in the late 1990s, can contribute to an attractive business environment.

    — Offering a favorable taxation environment for specific industries: India, for example, gives hardware and IT companies a tax holiday of up to five years to encourage entrepreneurship, while the United Kingdom offers partial tax relief to investors in specific businesses.

France offers a fitting example of how our analysis can help countries consider ways to gain a stronger presence on the global Internet ecosystem and increase the contribution the Internet delivers to the national economy (see Box 4, "The French experience").

2. Leveraging the Internet to revive the engine of growth

Understanding how much the Internet contributes to national economies and how this value is created lays a solid foundation for moving national policy and business strategy forward in a way that maximizes the benefits gained. Initiatives can be championed by government policy makers, by business executives, or by a partnership between the two groups, but in every instance the goal should be strengthening the domestic Internet ecosystem—consumption and supply—and delivering as much value to the economy as possible.

Box 4. The French experience

Though France sits in the middle ranks of the McKinsey Internet Supply Leadership Index, the country is moving forward with clear strengths. It has a strong user base, solid infrastructure, and quality math and science education. It is also one of the countries with higher contribution of Internet to growth and among mature countries, one of the countries where Internet contribution is growing the most.

France could build on these advantages while targeting areas that remain underdeveloped to create a more powerful ecosystem. Specifically, analysis based on the i4F indicator suggests that a focus on three areas—improved research collaboration between academia and industry, more aggressive development of technology clusters, and clear policies to attract top talent in the country—could bring substantial improvements. Some efforts have begun including, for instance, new tax credits for research (a 30 percent tax reduction for an R&D investment of up to €100 million and a 5 percent reduction above that threshold), and greater autonomy for universities. However, further work on these areas are likely to deliver promising results. In addition, efforts to build a critical mass and take advantage of the European large size could be accelerated.

2.1. Public decision makers should act as catalysts to unleash the Internet's growth potential

Public spending can be used as a catalyst to boost both usage and ecosystem. Public expenditures are a proven vehicle for getting more people and businesses online. Countries that have the highest public investment in the Internet as share of GDP tend also to gain the greatest contribution to GDP from the Internet. The United Kingdom, the United States, Sweden, and South Korea posted the highest average levels of investment in the Internet between 2000 and 2009, and each rank among the highest on the McKinsey Internet Supply Leadership Index and in contribution to GDP from the Internet. Sweden has pushed the development of e-government services and was ranked first in e-government advancement index in 2008 by the United Nations.

Public policy leaders could work to stimulate Internet usage among individuals, businesses, and government bodies. This can be accomplished by providing government-sponsored training sessions that instruct individuals and businesspeople on how to access the advantages offered by the Internet, offering incentives to the private sector to expand and improve infrastructure, and encouraging public agencies to develop e-government applications, allowing people and businesses to access government services and conduct business with the government online. The government's own usage encourages citizen use, and government e-transformation creates a large-scale, complex demand that stimulates the supply ecosystem (see Box 5, "Pushing Internet usage on three fronts").

Governments could also create a business environment that promotes technological development and innovation. Using regulations to maintain constructive competition; encouraging the deployment of advanced technologies; building top-level education and training centers in science, engineering, and other relevant fields; pushing companies to target the global market; and publically applauding successes are among the themes public leaders can embrace to put together an attractive environment.

Public officials could also focus some of their attention on SMEs, which as we have seen are critical to job creation and can garner large advantages from Internet proficiency. This can be done by assuring high-speed and very-high-speed access to the

Internet and adopting policies that encourage SME owners and managers to invest in digital technologies and to become adept at exploiting them.

These are among the many measures that will cultivate the four core areas of Internet ecosystems: human capital, financial capital, infrastructure, and the business environment (see Box 6, "Strength in the four critical areas is at the core of Bangalore's ecosystem").

Box 5. Pushing Internet usage on three fronts

Sweden and South Korea have both focused intense public energy on encouraging Internet usage on all fronts: individuals, businesses, and public bodies. These efforts are among the reasons these countries ranked high in many of the categories we examined while determining the economic impact of the Internet.

Sweden initiated numerous programs to push **individual usage.** Among the many efforts, it invested about €570 million to bring broadband Internet services to small towns and areas with low population densities, it launched an IT in Schools program to train 75,000 elementary and secondary teachers, it was quick to liberalize the telecommunications markets, and it offered subsidies to promote broadband expansion.

The government also focused attention on bringing the Internet to **businesses**. One program, financed jointly by the government and private sources, focused on teaching IT capabilities to businesses with fewer than ten employees. In another, the National IT Training Program, the government sought to teach IT skills to unemployed workers who lacked such training.

The **government** also turned the mirror on itself. In an effort called the 24/7 Agency, the government moved to modernize public administration and bring government services online. The diverse approach included allowing digital transmission of medical prescriptions and developing the world's first "virtual embassy" in the online environment Second Life. In 2008, Sweden was ranked first on the e-government advancement index by the United Nations.

In South Korea, the government launched a program called Ten-Million-People Internet Education, which focused on demographics not usually associated with Web activity, including the elderly, farmers, the disabled, prisoners, and housewives. The program offered government-subsidized training and reached 4 million people in 2000.

The government also encourages infrastructure investment, for example through certification programs for buildings larger than 3,300 square meters stating they are broadband ready and creating a broadband backbone between Seoul and Taejon using a mix of public and private financing. And the South Korean government works to boost Internet usage at schools, for instance by encouraging online homework.

2.2. All business leaders, not just e-CEOs, should put the Internet at the top of their strategic agenda

Business leaders, including those leading companies that are not directly involved with the Internet, must be proactive in taking advantage of benefits the Internet offers. This is especially true for entrepreneurs leading SMEs. With technology changing so rapidly, executives must regularly review their businesses, looking for ways the Internet can help them innovate more aggressively or reach new markets more rapidly. They must in particular be prepared to reinvent their business models to capture productivity and performance improvements unlocked by the Internet.

Managers also must not let the distractions of day-to-day business prevent them from contemplating the future. They must find time to consider the changes new technologies could soon bring to their businesses. Up-and-coming trends such as distributed co-creation and networks as organizations could radically change the way talent and work are organized. Operations are also evolving thanks to ideas such as the Internet of things, where chips create highly efficient networks from almost any physical product, and wiring for a sustainable world, where technology is put up against the world's environmental challenges.

The Internet is also spawning innovative business models such as innovation from the bottom of the pyramid, in which new ideas come from efforts to serve the lowest-income households, and multisided models that look for additional value from assets created operating a core business, such as selling market data. The Internet can also create opportunities in social goods, such as using new technologies to solve community problems (see Box 7, "Two trends to follow for decision makers").

Box 6. Strength in the four critical areas is at the core of Bangalore's ecosystem

India has become synonymous with taking advantage of IT and the Internet for economic growth, and Bangalore is at the epicenter. India accounts for more than two-thirds of IT services imports to developed countries from developing countries, and Bangalore, a city of 5.5 million people, accounts for just more than a third of it.[1] This success was built on a thriving Internet ecosystem supported by public policy and private investment across all four critical areas.

To develop **human capital**, the region established a broad network of premier technical and business educational institutions, including 12 universities, 98 engineering colleges, and 107 medical colleges. The effort included the opening of national institutes for advanced studies, which have become leading research and development centers.

Among its **infrastructure** initiatives, India helped create IT and electronic business clusters, such as Software Technology Parks created in 1991 and Electronic City. In addition, private investment led to such world-class campuses as the DBS Business Center in Bangalore. The introduction of incubators and datacom services, along with efficient transportation networks, create convenient locations for new companies.

Favorable tax policies, such limited-time exemptions on taxes for computer hardware and IT companies, and subsidies, including guarantees and favorable rates for electricity, contributed to an attractive **business environment.**

The government nurtured **financial capital** by leveraging the Bangalore stock exchange and promoting the growth of domestic venture capital funds. Bangalore offers strong financial support to entrepreneurs through several state government institutions, including the Karnataka Information Technology Venture Capital Fund (KITVEN), Bangalore.

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1   Deepak K. Sareen, Innovation and IT in India (Bangalore case study), presentation at the 2nd International conference on the process of innovation and learning in dynamic city regions, July 2005, Bangalore.

Box 7. Trends to follow for decision makers

Developments occur quickly around the Internet. And while it is important that businesses work diligently to squeeze as much benefit as they can from today's technology, leaders must also keep a watchful eye on new ideas that could drastically change the environment, lavishing advantages on the prepared, and perhaps taking from those caught unaware.

In our research we have been tracking many of these trends (See "Clouds, big data, and smart assets: Ten tech-enabled business trends to watch"). Here we highlight three developments seem particularly promising.

Cloud computing. Cloud computing separates IT resources, such as files and programs, from the devices used to access them. This can create many advantages, such as resource pooling and a near unlimited ability to enlarge or reduce available resources rapidly. By 2015, cloud computing could represent a $70 billion to $85 billion opportunity, with the market doubling every two years. Some technology watchers forecast that by 2015 cloud computing infrastructure and applications could account for 20 percent of total spend in these areas.

Fast movers in this technology could quickly gain substantial market share, displacing incumbents with new cloud-based solutions and reaching into new markets. The impact could reach 20 to 30 percent of the total IT budget for businesses willing to leverage this new technology.

Internet of Things.[1] In a rapidly developing trend called the Internet of Things, sensors and actuators embedded in physical objects—from roadways to pacemakers—are becoming linked through wired and wireless networks, often using the same Internet Protocol (IP) that connects the Internet. These networks churn out huge volumes of data that flow to computers for analysis. This merging of the physical and virtual worlds creates news ways of capturing value. Customer buying preferences can be associated in real time at a specific location, enabling more timely and relevant offers to be provided. Sensors on objects can enable companies to turn product sales into services sales, including everything from proactive maintenance, to selling usage instead of a capital good (e.g., car-sharing services in urban areas). Instrumenting complex systems such as electrical grids allows them to be operated with higher levels of efficiency and reliability, and can even be used to introduce dynamic pricing to further manage peak demand. Remote health monitoring can reduce the costs of treating patients while simultaneously improving their health outcomes. The numerous benefits of this trend result in an estimated growth rate of connected nodes on the Internet of Things of 35 percent annually for at least the next five years. As this trend continues to accelerate globally, companies and governments that move first into using the Internet of Things stand to gain knowledge that will enable competitive advantage.

Big data.[2] Companies with the capability to use the Internet, including the Internet of Thngs, to collect operational, consumer, and market data, could find their databases quickly overflowing with information. And while the Internet may no longer be "a wasteland of unfiltered data," as Clifford Stoll once feared, these databases, if left unmanaged, could become mammoth junkyards of useless bytes.

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1   Michael Chui, Markus Löffler, and Roger Roberts, "The Internet of Things," *The McKinsey Quarterly*, March 2010.

2   *Big data: The next frontier for innovation, competition, and productivity,* McKinsey Global Institute, May 2011 (www.mckinsey.com/mgi).

Box 7. Trends to follow for decision makers (continued)

Big data is a movement toward finding ways to manage databases that have become so massive that conventional tools are not adequate for capturing, storing, searching, sharing, analyzing, and visualizing this information. Enterprises that develop expertise in handling big data will find rich opportunities in areas such as creating transparency around these databases, reducing search time and easing concurrent processes, sifting through the data to uncover variabilities and areas for potential performance improvements, and segmenting large populations into usable groups based on a broad range of variables.

Looking at how advances in big data might affect various industries, we estimate the US health care industry could see annual productivity improvements of almost 1 percent over the next decade, creating potential value of more than $300 billion. The public sector in developed European countries could witness annual productivity gains of about 0.5 percent with a potential value of €255 billion.

2.3. All stakeholders should take part in a continuous and fact-based public-private dialogue

In addition to the individual efforts by government and business leaders, there are initiatives that require public-private dialogue for the greatest impact from the Internet ecosystem. Within individual countries and globally, open discussions between government and businesses are needed to make progress across a variety of issues, such as intellectual property in the digital age or data privacy.

To spur consumption, public and private leaders should explore solutions to such pressing issues as standards for legally valid digital identities, which would create even greater efficiencies in online business transactions, and intellectual property protection, which would unleash new markets and encourage greater creativity. The supply side also requires attention from all parties on vexing topics including net neutrality, talent availability, and the overall business environment.

A strong and continuous public-private dialogue is necessary to assure optimal conditions within each country and internationally.

3. Monitoring the progress of the Internet using four critical indicators

Putting a numerical value on the benefits that the Internet delivers to national economies requires sorting volumes of data from divergent sources. To ease the analysis and provide a "language" and tools to discuss the impact of the Internet, we developed four indexes that examine separate parts of the picture and together provide the full panorama. The first two—the e3 index and the iGDP—examine input and output indicators centered on expenditures and consumption. The next two—the McKinsey Internet supply leadership index and the i4F indicator—examine input and output indicators focused on data related to the supply side. Countries earnestly wishing to strengthen their domestic Internet ecosystem could review their progress against these indicators at least annually and make whatever adjustments are needed to assure a steady course.

As part of our effort to closely track how the Internet is affecting national economies, we plan to publish an annual report that follows and analyzes changes in these indexes. In addition, we have made public the details of our methodology of our indicators in an

effort to encourage open-source-type improvements. We welcome any criticisms and suggestions on how our analyses can be improved.

We will receive all contributions, synthesize them, and publish them to improve the way we measure the impact of the Internet.

3.1 The consumption indicators

The e3 index measures the maturity of a country's Internet ecosystem by considering input indicators linked to consumption. Data are collected in three essential areas: engagement, environment, and expenditures. Engagement, which weighs heavily in the index, covers private, corporate, and government use and gathers data on aspects such as number of personal computers in use, number of companies with a Web site or high-speed access, and number of government departments that can be reached online.

The iGDP indicator, reflecting direct Internet contribution to GDP, also examines consumption but in addition looks at output. Data gathered for this indicator help determine the overall contribution the Internet makes to a country's economy.

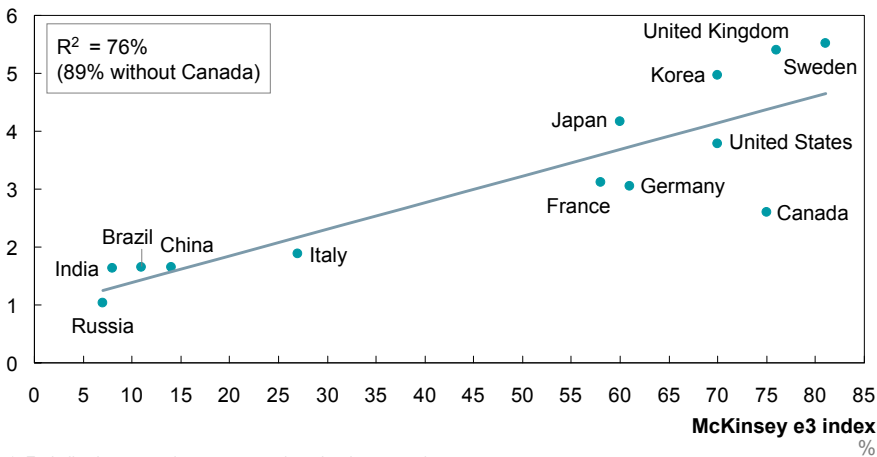Our e3 index and contribution to GDP are correlated (Exhibit 15).

Exhibit 15

Internet maturity is measured through internal consumption and correlated to the Internet contribution to GDP

Correlation between McKinsey e3 index and Internet contribution to GDP, 2009

Internet contribution to GDP[1]
% of GDP

1 Excluding imports and exports to restrict to local consumption.
SOURCE: World Economic Forum; McKinsey analysis

3.2 The supply indicators

The McKinsey Internet Supply Leadership Index, as we've noted, measures a country's overall participation in the global Internet ecosystem by examining supply-side inputs. The analysis is broken down into four key sections: current importance to the global ecosystem, performance within the ecosystem, recent growth, and activities that prepare a country for future developments. Taken together, these data represent each country's power within the dynamic Internet ecosystem and can help predict how the system might evolve

Supply outputs are gathered into the i4F indicator, which offers a valid representation of the vibrancy of a country's ecosystem. This indicator focuses on the four core areas of Internet development that we discussed earlier: human capital, financial capital, infrastructure, and the business environment.

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Common sense tells us that the Internet is a vital part of a modern, healthy, growing economy. And while previous studies have examined parts of the picture, McKinsey research for the first time shows the full extent of the Internet's economic power. And that power is massive.

In the 13 countries we studied, the Internet has contributed on average 3.4 percent to GDP, weighting more than agriculture, energy, and other better-established industries, and it adds considerable vigor to economic growth. Perhaps surprisingly, the brunt of this impact—about 75 percent—is from industries that are not directly linked to the Internet, except of course by their computers. This value comes primarily from increased productivity.

Understanding just how much the Internet contributes to national economies should spur government and business leaders to seek ways to optimize their participation in the global Internet ecosystem. Encouraging usage is an unavoidable first step in leveraging public spending, but leaders must also focus on providing human capital, financial capital, infrastructure, and the appropriate business environment.

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Online and upcoming: The Internet's impact on aspiring countries

Much of the research on how the Internet has affected business and the economy has focused on advanced nations or perhaps large developing countries such as India and China. In this report we turn our focus to what we call "aspiring countries," which are defined as having the economic size and dynamism to be significant players on the global stage in the near future and achieve levels of prosperity approaching those of the advanced economies.

Olivia Nottebohm, Dr. James Manyika, Dr. Jacques Bughin, Dr. Michael Chui, and Abdur-Rahim Syed

Executive summary

The Internet today connects about two billion people worldwide. Half of these are living outside the advanced economies, often in countries some that are quickly climbing the developmental ladder, with diverse populations and inarguable economic potentialities; countries as varied as Algeria, South Africa, China, Iran and Mexico. One indicator of development is Internet adoption. The pace at which countries outside of the advanced economies are adopting the Internet is much faster than that of advanced economies, yet 64 percent of the population in these countries remain unconnected. Research by us and others has highlighted the power of the Internet to contribute to economic growth and prosperity, and provide individuals, entrepreneurs, enterprises, and even governments with new ways to connect, consume and deliver products, services and content.

Few studies have focused on the impact of the Internet and the opportunity it offers in the developing world. The bulk of the research, including our own, has thus far looked at developed countries and focused primarily on the quantitative impact of the Internet on GDP. In this report, we take a different tack, choosing to examine more populous and faster-growing parts of the world where the Internet offers even greater potential. We look beyond the impact of the Internet on GDP: we measure its broader impact in terms of consumer surplus and the development of Internet ecosystems. We also look at how different participants have benefited from the Internet already, specifically measuring country environments for e-commerce and entrepreneurship, and analyzing in detail the impact of the Internet on small and medium-sized enterprises (SMEs). Finally, we try to assess the potential for future impact of the Internet on these countries.

We have defined 30 countries as "aspiring": i.e., those with the economic size and dynamism to be significant players on the global stage in the near future and achieve levels of prosperity approaching those of the advanced economies. Together, these 30 countries represent 30 percent of global GDP. We have studied nine of these in particular detail: Argentina, Hungary, Malaysia, Mexico, Morocco, Nigeria, Taiwan, Turkey, and Vietnam. The combined GDP of this group constitutes one-fifth of the GDP of our set of 30 aspiring countries. We chose not to study India or China, the two largest aspiring countries, as we have covered them previously in other reports.[1]

While the aspiring countries vary in terms of the nature and development of their Internet ecosystems, as well as the nature of opportunities and challenges they face, it was overwhelmingly clear that the potential for the Internet to transform these economies is quite significant. Each country we studied offered its own unique insights in terms of impact to date, opportunities, and challenges in a way that makes the country case studies interesting in their own right. However, in summary the report makes seven key findings:

1. **The Internet is growing at a tremendous rate in aspiring countries, but with distinctly different growth paths.** Internet penetration has grown at 25 percent per year for the past five years in the 30 aspiring countries, compared with 5 percent per year in developed countries. This phenomenal rate is possible because of previously low penetration: while average Internet penetration in most developed countries is above 70 percent, it is half that for most aspiring countries. The path that the growth is taking is different from that seen in the developed world. In aspiring countries it is partly the outcome of the high rates of adoption of mobile phones. Mobile subscriptions in these countries have increased from 53 percent of worldwide mobile subscriptions in 2005 to 73 percent in 2010. Many Internet users in aspiring countries are gaining access to the Internet solely through mobile phones, using mobile technology creatively to address local constraints.

2. **The impact of the Internet in aspiring countries has been significant, but there is tremendous potential impact if these countries reach developed world levels of access and usage.** The Internet contributes an average 1.9 percent of GDP in aspiring countries—$366 billion in 2010. By comparison, the Internet in developed countries contributes an average 3.4 percent of GDP. The great potential for Internet growth in the aspiring countries can be seen in our nine focus countries. There the Internet has accounted for anywhere between 1 and 13 percent of GDP growth over the past five years—adding an estimated total of $28 billion incremental GDP. The average contribution to growth in aspiring countries of 2.8 percent is much lower than that of developed countries, where the Internet has contributed an average of 21 percent to GDP growth between 2004 and 2009. A great deal of scope for growth in the aspiring countries is also present in Internet impact on consumer surplus. Today, measurable consumer surplus is between $9 and $26 per user per month in the nine aspiring countries, much lower than the $18 to $28 per user per month we have seen in developed economies. However, as a share of the Internet's contribution to GDP, it is higher than in advanced economies.

1   McKinsey Global Institute, *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, May 2011; *The McKinsey Quarterly*, "China's Internet obsession," March 2010; *The McKinsey Quarterly*, "Can India lead the mobile–Internet revolution?", February 2011.

3. **Individuals in aspiring countries have utilized the Internet in significant and dynamic ways.** Individuals have often been the first to benefit from the Internet in aspiring countries, mostly through free services such as e-mail, social networks, search engines, and access to information, educational, entertainment, and other content. The younger half of the population drives the adoption of online services, and the level of their engagement with certain online activities, such as social networking, often exceeds that of their developed country counterparts. As a result, individuals in these countries, when connected, have experienced greater change in access to content and services compared to their developed world counterparts. As already mentioned, the measurable consumer surplus has been significant. Social (non-economic) benefits of the Internet are also significant and can have an impact on the well-being of large numbers of people. These include individual benefits, such as the ability of individuals to access education and health information and join civic associations, as well as benefits to larger communities, such as the ability to coordinate disaster relief.

4. **Entrepreneurs in aspiring countries have thrived despite Internet ecosystem constraints.** Entrepreneurs in aspiring countries have been able to create many new businesses, many accessing customers and suppliers beyond their cities and countries. Many of these entrepreneurs have had to innovate, creating new business models that enable users to overcome local constraints, such as offering payment for online purchases upon physical delivery or using mobile accounts instead of credit cards. Occasionally, there have been entrepreneurs from aspiring countries who have ended up disrupting established models in the advanced economies. It's also important to note that many of these entrepreneurs are often effectively social entrepreneurs, as they are helping to build a robust Internet ecosystem that allows individuals, enterprises, and governments to play a broader and deeper role in the economy and society.

5. **There is tremendous potential for enterprises to leverage and gain benefits from the Internet—much more than they do today.** Large enterprises were the first to adopt broadband and now are leading the way in adopting more advanced Web technologies. They are as a result increasing revenue and lowering costs. Multinationals can also apply Web-based solutions learned in one market to operations in other countries. While in many aspiring countries they are constrained by distinct local conditions, those multinationals that have succeeded have reaped significant benefits from better resource management to increased efficiency among their employees. SMEs have not yet leveraged information and communication technologies (ICT) and Web technologies as much as large enterprises. SMEs continue to have lower broadband penetration and make limited use of electronic messaging and online marketing. The adoption of Web technologies by SMEs may propel economic growth in the aspiring world. Where they do deploy ICT and Web technologies, SMEs have found increased revenue, lower costs, higher productivity, and net job creation. Those SMEs that are investing in Web technologies such as e-mail, Web sites, cloud computing, and e-business solutions are also the ones growing the fastest. SMEs that spend more than 30 percent of their budget on Web technologies grow their revenue nine times as fast as SMEs spending less than 10 percent.

6. **Governments and the public sector are starting to offer better and more accessible public services through the Internet, but still have opportunity to go further.** E-government services are still nascent in aspiring countries. They have nonetheless already often allowed governments to improve delivery of services such as health care and education. As aspiring country governments invest more in e-government services, they are likely to step up from one-way information dissemination to highly efficient two-way transactional modes with their citizens. Aspiring country governments have also often played an active role in driving Internet access and use, from investing in infrastructure in rural areas to creating innovation clusters with a focus on Internet-driven growth.

7. **Aspiring countries can leverage their distinct characteristics to drive the development of Internet ecosystems.** Each aspiring country has very different macroeconomic profiles, (e.g., the role that trade already plays in the economy varies). Each element of strength can be leveraged to fully capture the power of the Internet to drive growth and prosperity. How each country chooses to leverage these characteristics will likely lead to different and distinct paths to fully capitalize on the Internet's potential and growth.

In addition to the summary findings above, it is worth noting a few broader themes as follows: Our research shows that across all countries it is generally individuals and small entrepreneurs that have experienced the greatest impact from the Internet. What these user groups can now do in terms of access, reach, and interaction has expanded significantly. The diversity of languages, cultures and human experiences that these individuals and entrepreneurs represent also dramatically expands the richness of the Internet in terms of its products, services, and content, as well as the range of creativity, entrepreneurship, and innovation that are displayed.

In economic terms, the Internet creates the potential for these countries to leapfrog certain steps of development and facilitate faster entry and participation in the global economy. However, for the Internet ecosystems of aspiring countries to mature, these countries need to ensure that several foundational elements are in place. Chief among these are a robust infrastructure, easy and inexpensive access to the Internet, robust commerce platforms, and industry structures that are open to competition so that users have access to rich and compelling products and services.

Lastly, it is important to note that with the growth of the Internet anywhere—whether in the developed or developing world—comes greater threats and possibilities for misuse. There are large and growing concerns regarding piracy, cybercrime, cyberterrorism and privacy. These are very real concerns that require concerted and coordinated action. However, it is our view that the power of the Internet to drive growth and prosperity far outweighs the risks and concerns, and so these concerns should not be an excuse to limit the growth and use of the Internet. The opportunities for individuals, entrepreneurs, enterprises, and government and policy makers are tremendous, as the details in this report suggest.

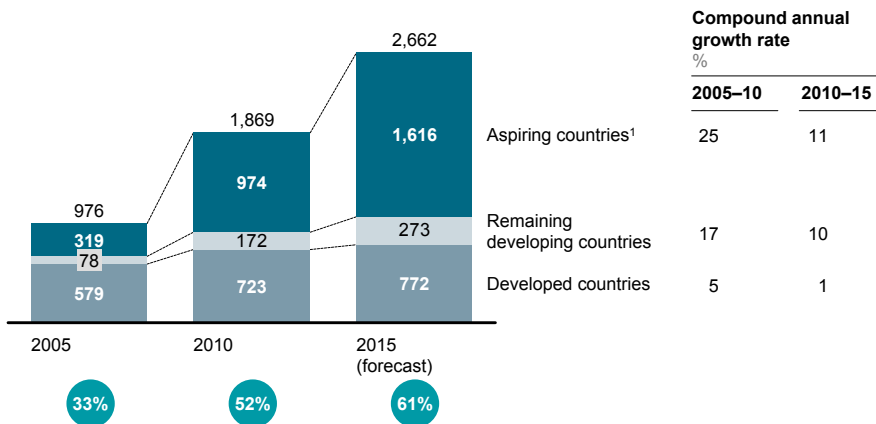# 1. The Internet is growing at a tremendous rate in aspiring countries, but with distinctly different growth paths

The Internet's presence in aspiring countries is significant. Even more noteworthy is the tremendous pace of its growth. From 2005 to 2010, the number of Internet users in aspiring countries has grown at about 25 percent per year (from 319 million users to 974 million users), approximately five times the growth rate of developed countries. The share of Internet users in aspiring countries has consequently increased from 33 percent in 2005 to 52 percent in 2010 and is forecast to further increase to 61 percent by 2015.[2] Looking forward, Internet use in aspiring countries is expected to grow at a rate of 11 percent per year, over ten times as fast as in developed countries (Exhibit 1).

Exhibit 1

More than half of current Internet users are in aspiring countries and their number is growing at ~five times the rate in developed countries

Estimated Internet users
Million users

● Share of global Internet users from aspiring countries

	Compound annual growth rate %	
	2005–10	2010–15
Aspiring countries[1]	25	11
Remaining developing countries	17	10
Developed countries	5	1

1 Includes Algeria, Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Kazakhstan, Malaysia, Mexico, Nigeria, Pakistan, Poland, Romania, Saudi Arabia, South Africa, Taiwan, Thailand, Turkey, Ukraine, Vietnam. Data unavailable for Morocco from this source.

SOURCE: Economist Intelligence Unit (EIU) World Data; McKinsey analysis

Having cost-effective and high-quality Internet access is crucial to spreading the technology in aspiring countries. An expanding Internet infrastructure has allowed the dramatic rise of Internet use in aspiring countries, often with lower connectivity costs. Advances in PC and mobile phone technologies have led to better performance at much lower cost. millions of people are today accessing the Internet through simple feature phones.

In the evolution of their Internet ecosystems, the aspiring countries we studied have some shared experiences as well as some very distinct differences. Similarities have included the importance of infrastructure and digital literacy as building blocks. E-commerce has also thrived, although only where certain preconditions have been met, including the security of paying online and the degree of trust in parcel delivery. Differences have often arisen in the way countries have circumvented such barriers. Some countries have overcome constraints related to the security of online

2   Economist Intelligence Unit World data, Internet users, 2011.

payments through increased legal protections; others have found alternatives to credit card payment such as online payments tied to mobile phone billing. Another example of such differences is in parcel delivery systems. Private-sector players have often stepped in to provide reliable parcel delivery. In addition, entrepreneurs have often found creative ways to circumvent parcel delivery issues such as shipping to local grocery stores that can hold products for pick up. It is clear that while cost and access constraints have limited Internet penetration and the engagement of users in all countries, individuals have often found new and innovative ways to leverage the Internet for their economic and social benefit.

High-quality Internet access was once prohibitively expensive for many users in aspiring countries, as the fixed and variable costs associated with fixed-line broadband was usually passed on to individuals. The rise, and near ubiquity, of mobile Internet has circumvented this problem. Mobile phones are less expensive than laptops, and rural areas are now made accessible without prohibitive capital outlays on cable. Mobile device subscriptions have grown at significantly higher rates in the aspiring world. Between 2000 to 2010, the annual growth of mobile subscriptions was 7 percent in the United Kingdom and 9 percent in the United States. Over the same period, Argentine mobile subscriptions grew at 22 percent per year and Malaysian mobile subscriptions at 19 percent per year. The difference is even more dramatic when we look at countries that have more serious infrastructure challenges. Mobile subscriptions in Vietnam grew at an annual rate of 67 percent and in Nigeria at 109 percent over this period.[3] While only 25 percent of Internet users in developed countries such as the United States and United Kingdom gain Web access principally through mobile phones, in aspiring countries that share is often much higher: in Egypt it is 70 percent; in India, 59 percent; and in Nigeria 50 percent.[4] These users are urban as well as rural, and are often young people.

In summary, the state of the Internet at the time of writing varies significantly across different aspiring countries and also when compared with the advanced economies. (See Exhibits E2 and E3 for a summary of the landscape of Internet usage, impact, and ecosystem health across the aspiring countries on which we focus, with a set of developed countries included for comparative purposes.)

Internet users in aspiring countries have adopted certain online activities more quickly than their counterparts in developed countries. The popularity of social networking is one example. Globally, Internet users spend 17 percent of their online time on social networks.[5] But aspiring country users often use social networking at much higher levels. Mexican users spend 30 percent of their time online and Malaysian users 33 percent engaged in social networks.[6] Social networking for the purposes of communication partly drives this behavior, as social networks offer an inexpensive alternative to telephone communication within and between countries. The economics for the individual has driven the popularity of Internet-based alternatives to more expensive traditional communication. Skype, for example, is already the world's largest international voice carrier.[7]

3   Economist Intelligence Unit World data, Internet users, 2011.

4   On Device Research, "The 'Mobile Only' Internet Generation," December 2010.

5   ComScore, "The network effect: Facebook, LinkedIn, Twitter & Tumblr reach new heights in May," June 2011.

6   ComScore, "Social networking accounts for one-third of all time spent online in Malaysia," October 2011.

7   Mikael Ricknäs, "Skype is largest international voice carrier, says study," IDG News Service, March 25, 2009.

It is only a matter of time before aspiring countries develop a much richer and more textured global Internet ecosystem. While English is still the primary language of the Internet, the languages of aspiring countries are the fastest-growing on the Internet—73 percent of users Internet users do not speak English as a first language. From 2000 to 2011, while the English-speaking Internet user base was growing by 301 percent, Arabic-speaking Internet users were growing by 2,501 percent, and Chinese-speaking users were growing by 1,479 percent (Exhibit 4).[8]

Exhibit 2

Internet landscape and impact statistics

Top quartile Third quartile
Second quartile Bottom quartile

	Internet users Million	Internet penetration % of population	Fixed broadband subscribers % of population	Mobile broadband subscrip- tions % of population	Median monthly cost of 1 Mbps $ PPP	Online retail share of retail %	Internet contribution to GDP[1] % of GDP	Internet contribution to GDP growth[1] % of GDP growth
Argentina*	26	64	10	13	16	1.1	2.2	2.7
Brazil	79	41	7	11	17	3.1	1.4	2.4
Canada	28	81	30	15	5	0.9	2.7	10.2
China	486	36	9	2	11	1.1	2.6	3.4
France	50	78	33	36	8	3.8	3.2	17.6
Germany	67	82	32	36	4	3.8	3.2	24.3
Hungary*	7	68	20	30	3	1.1	3.9	11.4
India	98	8	1	1	59	0.3	3.2	5.2
Italy	33	54	22	59	7	0.9	1.7	12.2
Japan	101	79	27	88	–	3.2	4.0	–
Malaysia*	16	55	7	27	50	4.4	4.1	2.3
Mexico*	39	34	10	8	22	0.5	1.0	2.2
Morocco*	16	49	2	10	–	0.5	0.9	1.2
Nigeria*	52	33	<1	3	–	0.1	0.5	0.9
Russia	61	43	11	17	5	2.1	0.8	0.9
South Korea	40	83	36	91	-	12.3	4.6	16.0
Sweden	8	90	32	84	3	3.8	6.3	32.9
Taiwan*	16	72	23	–	–	3.0	5.4	12.7
Turkey*	36	49	10	18	9	0.8	0.9	1.5
United Kingdom	53	85	31	56	4	7.7	5.4	22.7
United States	250	81	27	54	5	4.0	3.8	14.9
Vietnam*	27	31	4	13	41	–	0.9	1.6

* Focus aspiring countries

1 Internet contribution to GDP calculated in 2010 for Argentina, Hungary, Malaysia, Mexico, Morocco, Nigeria, Taiwan, Turkey, Vietnam and in 2009 for all other countries. Internet contribution to GDP growth is calculated from 2005 to 2010 for Argentina, Hungary, Malaysia, Mexico, Morocco, Nigeria, Taiwan, Turkey, Vietnam, and from 2004 to 2009 for all other countries.

SOURCE: Internet World Statistics, 2010; Hungarian Central Statistical Office 2010; Economist Intelligence Unit Telecoms and Technology Report data for 2010, published in 2011; Morocco, Agence Nationale de Reglementation des Telecommunications, 2010; Malaysia Communications and Multimedia Commission data for 2010, published in 2011; ICT Vietnam Whitebook data for 2010, published 2011; International Telecommunication Union, World Telecommunication/ICT Development Report and database, 2010; World Bank population data, 2010; Cost of 1 mbps from Speedtest.net pulled in November 2011, PPP adjustment to US dollar using World Bank 2010 conversion rate; Euromonitor International, 2010; McKinsey analysis

8   Internet World Stats, "Top ten languages used in the Web," http://www.internetworldstats.com/stats7.htm (accessed December 1, 2011).

Exhibit 3

Internet foundations statistics
Scale to 100

Legend: ■ Top quartile ■ Second quartile □ Third quartile ■ Bottom quartile

	Human capital	Base infra-structure	Internet infra-structure	Internet access-ibility	Ease of Internet entrepre-neurship	E-commerce enable-ment	Financial capital	Business environ-ment	Global connected-ness
Argentina*	17	22	32	24	21	30	5	32	37
Brazil	25	39	30	31	29	44	16	34	37
Canada	31	60	79	78	84	78	30	80	52
China	69	46	27	19	35	34	23	55	31
France	35	60	70	71	71	70	30	72	54
Germany	36	60	75	80	59	71	21	80	59
Hungary*	22	42	57	58	64	51	10	46	46
India	25	26	11	10	25	28	24	45	29
Italy	20	36	47	57	45	50	12	51	44
Japan	42	60	69	61	54	67	19	80	35
Malaysia*	25	57	40	25	40	44	27	65	68
Mexico*	16	29	23	35	33	36	10	40	43
Morocco*	23	37	17	35	39	25	19	41	47
Nigeria*	13	9	4	44	36	20	11	36	37
Russia	57	31	27	41	42	34	16	32	41
South Korea	43	60	76	56	57	64	19	61	38
Sweden	35	60	91	87	71	75	37	89	60
Taiwan*	35	60	66	67	71	67	43	71	65
Turkey*	19	43	42	24	43	35	13	47	40
United Kingdom	37	60	87	88	78	80	27	79	65
United States	85	60	76	80	76	81	81	79	53
Vietnam*	40	32	24	11	30	21	16	43	39

* Focus aspiring countries

Exhibit 4

While English remains the primary language for Internet users, growth is in aspiring country languages

Primarily developed
country languages

Primarily aspiring
country languages

	Top ten languages on the Internet Internet users, million	Growth in Internet users %, 2000–11
English	537	301
Chinese	445	1,479
Spanish	153	807
Japanese	99	111
Portuguese	83	990
German	75	174
Arabic	65	2,501
French	60	398
Russian	60	1,826
Korean	39	107
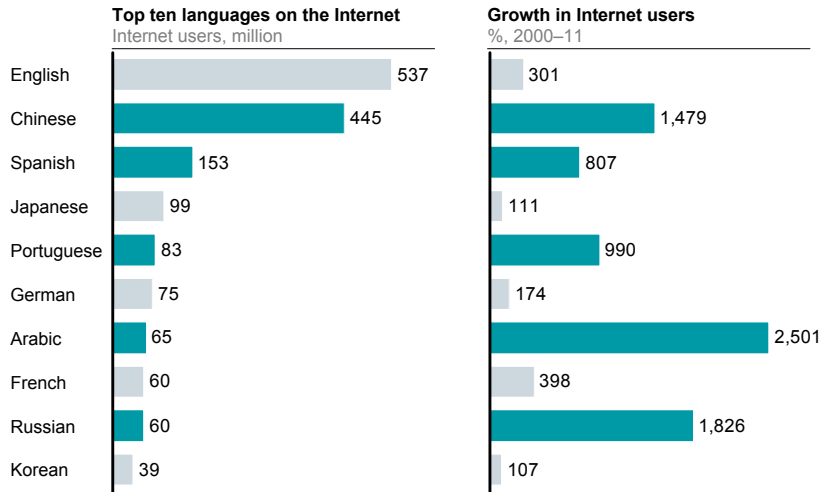
SOURCE: Internet World Stats

2. The impact of the Internet in aspiring countries has been significant, but there is still tremendous potential if these countries reach developed world levels

The economic and social impact of the Internet on individuals and communities has already been significant, though low compared to the advanced economies. We have measured the impact of the Internet on GDP and consumer surplus, two elements that constitute only a part of its total impact. The richness of the Internet and its far-ranging social impact on individuals online and offline is difficult to quantify, but we have tried to give a sense of the breadth of that impact through illustrative examples. In our analysis of the SME sector, we have also assessed Internet-related job creation and productivity gains. We made conservative ingoing assumptions in this area, not taking into account, for example, the wider benefits to society through increased transparency, or benefits to the economy from a more diversified base of economic activity. We therefore believe that our sizing of the total impact of the Internet is likely to be understated.

In 2010, we estimate that the total contribution of the Internet to GDP in all aspiring countries was
$366 billion.[9] Of this, $66 billion came from our nine focus aspiring countries, $243 billion from the BRICs (Brazil, Russia, India, and China), and $57 billion from the remaining aspiring countries (Exhibit 5). If we consider that the Internet contributes an average of 1.9 percent to the GDP of all aspiring countries compared with 3.4 percent in developed countries, it becomes apparent that the Internet has a great deal of room to bolster further economic growth in aspiring countries. In absolute terms, this potential is even more striking. The economic value generated
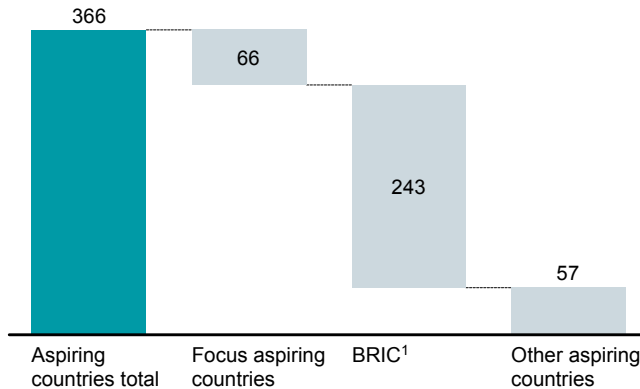
9   Internet contribution to GDP is calculated in detail for the nine focus countries and BRIC countries and is
     estimated for the remaining aspiring countries using best available data.

annually by the Internet is \$119 per capita in aspiring countries compared with \$1,488 per capita in developed countries.[10]

Exhibit 5

The Internet contributed \$366 billion to aspiring countries' economies in 2010—1.9 percent of a total GDP of \$19.3 trillion

Internet contribution to GDP, aspiring countries
\$ billion, 2010

| Aspiring countries total | Focus aspiring countries | BRIC[1] | Other aspiring countries |
| 366 | 66 | 243 | 57 |

1 For the Internet contribution to GDP in Brazil, Russia, India, and China, see McKinsey Global Institute, *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, May 2011.

SOURCE: Gartner; Global Insight; Organisation for Economic Co-operation and Development (OECD); ITU; International Data Corporation (IDC); World Health Organization (WHO); ICD; iConsumer US 2010; Euromonitor; H2 Gambling Capital; PhoCusWright; Pyramid Research; UN Educational, Scientific and Cultural Program (UNESCO); McKinsey analysis

This economic impact varies widely even among countries at a similar stage of development. Among the nine aspiring countries on which we focused, the Internet contributed between 0.5 and 5.4 percent of GDP. Among developed countries, the Internet contribution to GDP ranged from 1.7 to 6.3 percent. The scope for potential impact in aspiring countries is clear, and robust Internet ecosystems could unlock much more value (see Box 1, "Common factors need to be addressed to build a robust Internet ecosystem").
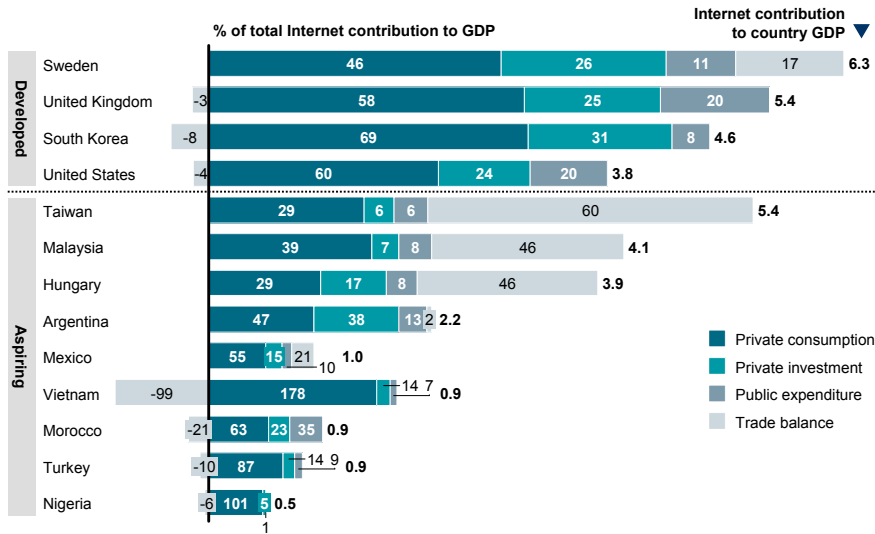
A related difference between developed and aspiring countries is in the composition of the Internet's GDP contribution. GDP, the value of all goods and services produced in an economy, can be measured as the sum of investment by the public sector (e.g., government, nongovernmental organizations); investment by the private sector (e.g., enterprises); consumption of goods and services; and export of goods and services, minus imports of the same. We have measured the Internet-related proportion of each category that contributes to GDP, thereby providing a total contribution of the Internet to GDP. For most aspiring countries, Internet-related consumption forms the vast majority of the contribution to GDP (Exhibit 6). Individuals are the first to benefit from the Internet through their engagement in social media, communication, gaming, and consumption-focused activities. The Internet's enterprise benefits are more prevalent in the mature Internet ecosystems of the developed countries. Internet-related private investment therefore contributes less to GDP in aspiring countries (13 percent) than in developed countries (29 percent).

10   Developed countries estimated by aggregating Canada, France, Germany, Italy, Japan, South Korea, Sweden, the United Kingdom, and the United States.

The total contribution of the Internet to GDP in some aspiring countries, notably Taiwan and Malaysia, is similar to those levels observed in developed countries. While consumption is high, these aspiring countries benefit from being net exporters of ICT goods and services. In fact, the most notable difference between the contribution of the Internet to GDP in aspiring countries compared to developed countries is how the trade balance can take precedence over other contributing factors. On average in aspiring countries, 32 percent of the contribution of the Internet to GDP is due to net exports of ICT-related goods, compared with 3 percent for developed countries.[11]

Exhibit 6

Private consumption forms the bulk of the Internet's contribution to GDP in most aspiring countries

% of total Internet contribution to GDP

Internet contribution to country GDP ▼

	Country	Private consumption	Private investment	Public expenditure	Trade balance	Internet contribution to country GDP
Developed	Sweden	46	26	11	17	6.3
	United Kingdom	58 (-3)	25	20		5.4
	South Korea	69 (-8)	31	8		4.6
	United States	60 (-4)	24	20		3.8
Aspiring	Taiwan	29	6	6	60	5.4
	Malaysia	39	7	8	46	4.1
	Hungary	29	17	8	46	3.9
	Argentina	47	38	13	2	2.2
	Mexico	55	15	21	10	1.0
	Vietnam	178 (-99)	14	7		0.9
	Morocco	63 (-21)	23	35		0.9
	Turkey	87 (-10)	14	9		0.9
	Nigeria	101 (-6)	5	1		0.5

Legend: Private consumption, Private investment, Public expenditure, Trade balance

SOURCE: Gartner; Global Insight; OECD; ITU; IDC; WHO; ICD; iConsumer US 2010; Euromonitor; H2 Gambling Capital; PhoCusWright; Pyramid Research; UNESCO; McKinsey analysis

From 2005 to 2010, the Internet accounted for 2.8 percent of the combined GDP growth of the nine aspiring countries on which we focus.[12] The Internet accounted for 21 percent combined GDP growth in the developed countries studied (Exhibit 7).[13] While this difference can be partly explained by high growth in aspiring countries that makes the contribution seem proportionally smaller, it also points to the very large untapped potential of nascent Internet ecosystems for swift growth.
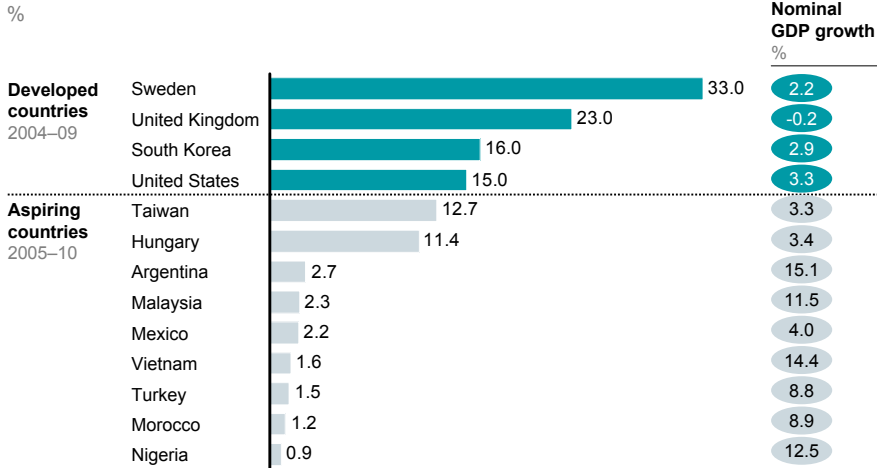
While expenditure on Internet-related goods and services is easily measurable and incorporated in calculations of the Internet's contribution to GDP, consumer utility is more difficult to assess. Extrapolating from survey-based data on the value of free Internet services—from e-mail to browsing to information services and search, net of annoyances like spam and excessive advertising—we have estimated the consumer surplus for aspiring countries. We found that consumer surplus is significant, ranging from $9 per month per Internet user in Nigeria to $26 per month per Internet user in

11 McKinsey Global Institute, Internet matters: The Net's sweeping impact on growth, jobs, and prosperity, May 2011.

12 Internet contribution to GDP growth is defined as the increase in Internet contribution to GDP, divided by the overall GDP growth in the same time period.

13 As assessed in McKinsey Global Institute's *Internet matters* report, using the same methodology as in this report, but from 2004 to 2009.

Taiwan. Consumer surplus per user in most aspiring countries is significantly lower than that of developed countries, where it ranges from $18 to $28 per user per month.

Exhibit 7

The Internet's contribution to GDP growth is higher in mature economies than in fast-growing ones

%

			Nominal GDP growth %
Developed countries 2004–09	Sweden	33.0	2.2
	United Kingdom	23.0	-0.2
	South Korea	16.0	2.9
	United States	15.0	3.3
Aspiring countries 2005–10	Taiwan	12.7	3.3
	Hungary	11.4	3.4
	Argentina	2.7	15.1
	Malaysia	2.3	11.5
	Mexico	2.2	4.0
	Vietnam	1.6	14.4
	Turkey	1.5	8.8
	Morocco	1.2	8.9
	Nigeria	0.9	12.5

NOTE: For consistency across countries, where possible GDP growth figures are based on the World Bank's World Development Indicators: US dollars at current prices. Estimates from other sources may differ.

SOURCE: McKinsey Global Institute, *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, May 2011; Gartner; Global Insight; OECD; ITU; IDC; WHO; ICD; iConsumer US 2010; Euromonitor; H2 Gambling Capital; PhoCusWright; Pyramid Research; UNESCO; McKinsey analysis

Consumer surplus, as a share of Internet contribution to GDP, is higher in aspiring countries than it is in developed ones. This is in line with our broader findings that individuals are the first to benefit from the Internet in aspiring countries. We believe that there is significant room for growth here. We found that the total consumer surplus would increase from $135 billion to $364 billion per year in aspiring countries if Internet penetration reached the levels in developed countries. This is a conservative number, as we have not quantified all categories of consumer use. Our consumer surplus estimates cover the broad categories of communication, entertainment, and services.[14] Our estimates are not exhaustive, however; for instance, we leave out some categories such as "document sharing" made newly popular by start-ups such as Dropbox. Furthermore, we do not account for the offline benefits of having a robust Internet ecosystem, such as the ability to research products online even if they are purchased offline.

Beyond the Internet's economic impact, users gain significant social utility from the Internet. The Internet has allowed individuals to participate in social issues of their concern, as well as connect with like-minded communities and civic groups. Users can leverage the Internet to stay informed on matters of civic interest and communal and individual well-being such as health, emergencies, and disaster relief. Aspiring countries are leveraging the Internet for social impact in diverse ways. Two typical examples are mPedigree, a public-private partnership that uses mobile networks and the cloud to tackle drug counterfeiting in sub-Saharan Africa and South Asia, and the Khan Academy, which provides free classes online throughout the world.

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14 Consumer surplus is measured across communication (e-mail, instant messaging, telephony, social); entertainment (games, music, video, WebTV); and services (P2P, search, comparison, mapping, directories, yellow pages, blogs, wikis, advertising, privacy).

Box 1. Common factors need to be addressed to build a robust Internet ecosystem

The first step to a robust Internet ecosystem is quality infrastructure. Basic infrastructure, such as reliable electricity supply and roads to allow postal delivery, is a must, as well as quality fixed or mobile Internet infrastructure. Secure Internet servers and large international Internet bandwidth are necessary to fully capture the value from the Internet. A lack of secure servers can increasingly be circumvented with cloud solutions, depending upon the availability of reliable Internet supply. A wide range of technological options for this are available, including 3G, 4G, WiMax, satellite, cable, and dial-up.

Beyond infrastructure, a mature Internet ecosystem is defined by the intensity of Web use by all stakeholders, the main ones being individuals, businesses, and government. Getting more individuals online requires raising the level of digital literacy, cutting the cost of access to both devices and Internet connections, and developing quality offerings, including content in the national language. Businesses also derive considerable benefits from the Web but need to invest in Web technologies that drive productivity and allow companies to access new markets, customers, and suppliers. Such investments also involve employee training in Internet use and a healthy broadband infrastructure. Finally, governments need to invest in quality online services that will engage citizens and help them realize cost savings from increased efficiency.

If infrastructure is present and users are becoming engaged, the next step is leveraging the Internet for economic and social benefits. This includes promoting business-to-business (B2B) e-commerce to increase enterprise productivity and facilitate exchanges between businesses, and promoting business-to-consumer (B2C) e-commerce to benefit individuals. Entrepreneurs have often been critically important in unlocking the power of the Internet, but a common constraint has been access to capital for early-stage investments.

3. Individuals in aspiring countries have utilized the Internet in significant and dynamic ways

For individuals in the aspiring world, adoption of Web technologies has grown and continues to grow rapidly. The high rate of adoption has been driven by the utility that individuals derive from the Internet, including a host of benefits from search to shopping, and from media consumption to access to information.

Some are direct and highly visible benefits such as consumer surplus from e-commerce, which provides access to wider variety of goods and services that would otherwise not be available. E-commerce in aspiring countries grew significantly from 2005 to 2010 and is projected to continue expanding.[15] E-commerce not only provides consumers choice in purchasing goods and services, but also increases competition that leads to more competitive pricing and price transparency in both online and offline retail outlets. Online research, furthermore, allows consumers who prefer to purchase offline to make more educated purchasing decisions.

Individual benefits extend well beyond consumer surplus. Users can gain access to a wide range of research tools in areas like education and health, and participate in activities online from filing taxes to identifying the best available crop prices in real time. Similarly, the Internet promotes community by helping online individuals find other people with similar interests and hobbies.

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15   Euromonitor.

The benefits of the Internet accrue to both Internet users and non-users. The Internet enhances transparency in the political sphere, for example, through publication of campaign contributors, or in the commercial sphere by enabling price comparisons. Those not online can still benefit from enhanced transparency. Farmers who are not online, for example, can benefit from more competitive pricing for the goods they purchase and sell if other farmers have drawn in more customers or reduced the role of intermediaries. This happened in Ghana when the innovative service Esoko began collecting and distributing agricultural market data in a system that is now used across much of Africa.

Much of the online engagement in aspiring countries is by young users. Web technology users in aspiring countries are younger on average than those in developed countries (Exhibit 8). In Turkey the median age of Internet users is 28, while in Europe it is 44.[16] Web-related technologies are most popular with young users. In aspiring countries they drive adoption of free or low-cost technologies and activities such as social networking or VoIP (voice-over Internet protocol). They are also the first users of higher-cost Web technologies such as smartphones, which they use in greater numbers than do their counterparts in developed countries.

Exhibit 8

Consumers under 35 represent a greater share of the smartphone, VoIP, and social network markets in aspiring countries

% of total market share by age group and country type

■ Share of total penetration rate by those 35–55[1]
■ Share of total penetration rate by those <35[1]

	Developed countries	Aspiring countries
Smartphones[2]	40 / 60	28 / 72 (+20%)
VoIP[3]	34 / 66	24 / 76 (+15%)
Social networks[4]	41 / 59	26 / 74 (+26%)
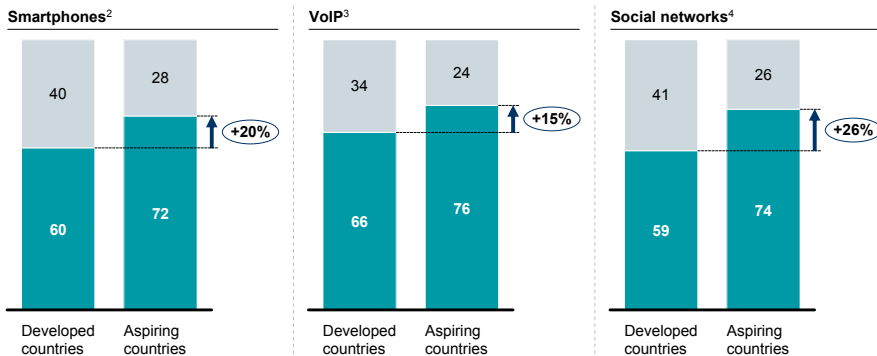
1 Analysis and illustration exclude consumers over 55 due to inconsistent data.
2 Aspiring countries include Brazil, China, Poland, and Russia. Developed countries include France, Germany, Italy, Netherlands, Spain, the United Kingdom, and the United States.
3 In addition to countries included in footnote 2, additional aspiring countries include India and Malaysia.
4 This sample includes the same countries as for footnote 3; social network penetration is based on consumers using social networks at least once a week.
SOURCE: 2011 McKinsey iConsumer survey (~28,000 survey respondents across aspiring countries and ~53,000 survey respondents across developed countries; only urban responses collected in India, China, and Malaysia)

4. Entrepreneurs in aspiring countries have thrived despite Internet ecosystem constraints

Entrepreneurs in aspiring countries have leveraged increases in Internet use and infrastructure improvements to create new business models. From successful implementations of popular Web applications in developed countries to new commerce and policy platforms, entrepreneurs have brought new services, expanded products, and deeper content within reach of users in aspiring countries. With about 150,000 Internet-related businesses started each year in aspiring countries, entrepreneurs have

16   United Nations, "World Population Prospects: The 2010 Revision," 2010.

driven much of the growth of the Internet ecosystems in aspiring countries. They are building the foundations that consumers and enterprises can then take advantage of.

Entrepreneurship in aspiring countries has been encouraged by demand for localized solutions to local constraints or modification of successful Internet models from developed countries to the local market. Examples of this entrepreneurship include the design of new ways to pay online, like mobile payments tied to bank accounts. Similarly, innovation in parcel delivery has yielded new solutions such as those involving networks of local businesses in the delivery of products to end users. Start-ups have replicated successful business models created in developed countries while simultaneously adapting to unique local conditions. Trendyol, a Turkish Internet service with a business model similar to Gilt Groupe, very successfully leverages social networking for sales and marketing and has drawn a large number of followers on Facebook.[17] Many entrepreneurial ventures in aspiring countries also address broader social issues. For example, EpiSurveyor, a Web- and mobile phone-based data collection platform often used to collect public health data remotely, has played a critical role in tracking polio monitoring.

Constraints still hamper the effectiveness of small actors in the Internet ecosystem. The level of digital literacy that is sufficient for young people using social networking and media sites is usually insufficient for enterprises using Web technologies. In aspiring countries there is a lack of awareness about more advanced enterprise Web technologies such as electronic customer relationship marketing (eCRM). Entrepreneurs must face the constraints cited by small enterprises as the most challenging: the cost of equipment and availability of the Internet. Inadequate venture capital environments also hold back entrepreneurs. Inward ICT foreign direct investment (FDI) tends to focus on large telecommunications projects or Internet businesses that have already achieved scale. In most aspiring countries the high cost of capital constrains entrepreneurial access to loans and early-stage investment. As a result, even entrepreneurs with promising growth often have difficulty scaling.

5. There is tremendous potential for enterprises to leverage and gain benefits from the Internet—much more than they do today

Large enterprises were early adopters of Web technologies in aspiring countries. Having gained an early competitive advantage, these enterprises then used the Internet to capture market share and gain profitability. Today, they continue to adopt new and sophisticated Web technologies that may still be out of reach for small enterprises that lack similar access to capital—technologies that also enable cost reductions by increasing productivity and decreasing administrative overhead.

Multinational corporations have additionally benefited by applying standardized Web-based solutions across the various aspiring countries in which they operate. However, specific local constraints make such strategies challenging. Multinationals able to overcome these challenges receive additional benefits ranging from increased resource management to improved employee efficiency.

Web technologies have also enabled some companies in the aspiring world to innovate and grow. Companies that were once start-ups in these economies have now risen to prominence by creating Internet-based solutions to constraints on everyday life in these countries. M-Pesa, an innovative service created by Safaricom and owned

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17   Y. M. Ousley, "Turkish flash sales site Trendyol raises $26 million," *Internet Retailer*, August 16, 2011.

by Vodafone, originally allowed microfinance borrowers to receive and repay loans conveniently, using a network of mobile airtime resellers.[18] By promoting financial inclusion, the service has grown rapidly. M-Pesa now operates in South Africa and three other countries and accounts for 7 percent of Vodafone's total money transfer revenue.[19]
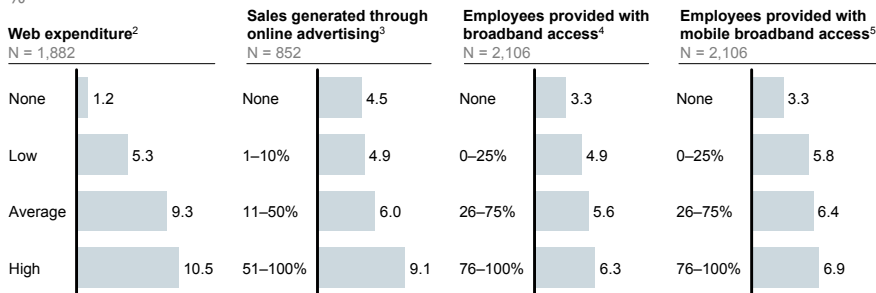
While SMEs in aspiring countries are largely under-leveraging the Internet, those that have leveraged its potential have attracted significant benefits, including accelerated growth, larger profits, and competitive advantage in the markets in which they compete.

SMEs that have embraced Web technology in the past three years have grown faster than those that have not. SMEs with larger investments in Web technologies have grown the fastest. Growth in SMEs correlates positively with a firm's investment in Web technologies, including online advertising, broadband, and mobile broadband. SMEs not currently invested in the Web but planning to invest within the next two years believe they can catch up with those already invested, while those with no plans to invest believe they will fall further behind (Exhibit 9).

Exhibit 9

SMEs' high growth correlates positively with Web spending, online sales generation, broadband access, and mobile broadband access

SME stated growth[1]
%

Web expenditure[2] N = 1,882	Sales generated through online advertising[3] N = 852	Employees provided with broadband access[4] N = 2,106	Employees provided with mobile broadband access[5] N = 2,106
None 1.2	None 4.5	None 3.3	None 3.3
Low 5.3	1–10% 4.9	0–25% 4.9	0–25% 5.8
Average 9.3	11–50% 6.0	26–75% 5.6	26–75% 6.4
High 10.5	51–100% 9.1	76–100% 6.3	76–100% 6.9

1 Excludes all respondents who did not know their company's growth rate.
2 Low Web expenditure is less than 10% of total expenses. Average is 11–30% of total expenses. High is greater than 30% of total expenses. "What percentage of your expenses are digital, i.e., linked to Web technologies (electronic messaging, intranet, extranet, WiFi, Web sites, Web 2.0 tools, servers/routers, Web connection for employees, Enterprise Resources Planning (ERP), e-commerce, e-marketing, e-supply chain)?" Excludes "I don't know" responses.
3 "What percentage of your revenues are driven by ONLINE advertising? 2010 (projected)." Excludes "I don't know" responses.
4 "Do you have a broadband Internet connection available to your employees?" If so, "What percentage of your employees have access to it?"
5 "Do you have access to wireless Internet through a mobile broadband connection?" If so, "What percentage of your employees have access to it?"
SOURCE: 2011 McKinsey survey of 2,484 SMEs across Argentina, Hungary, Malaysia, Mexico, Morocco, Taiwan, Turkey, and Vietnam; McKinsey analysis

SMEs in aspiring countries that use Web technologies have cited increased revenue, reduced cost of goods sold, and decreased administrative and operations costs (Exhibit 10).

Surveyed SMEs reported that Web technologies have enabled productivity increases of an average of 11 percent. Higher Internet-enabled productivity gains, furthermore, correlated to greater profitability gains (Exhibit 11).
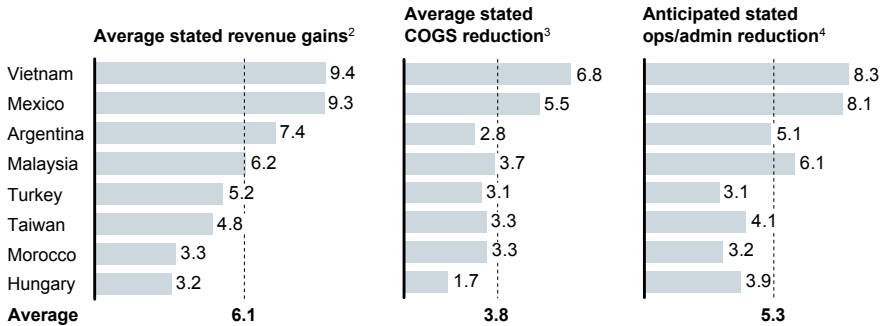
18 N. Hughes and S. Lonie, "M-Pesa: Mobile money for the "unbanked": Turning cellphones into 24-hour tellers in Kenya," *Innovations: Technology, Governance, Globalization*, Volume 2, Issue 1-2 (2007): 63–81.
19 Peter Gakure-Mwangi, "M-pesa earns Vodafone SH1.8 billion in 2010/2011 in [license] fees," Thinkm-pesa.com, August 15, 2011.

Exhibit 10

Across eight aspiring countries, SMEs say the Internet has allowed them to gain revenue and reduce costs[1]
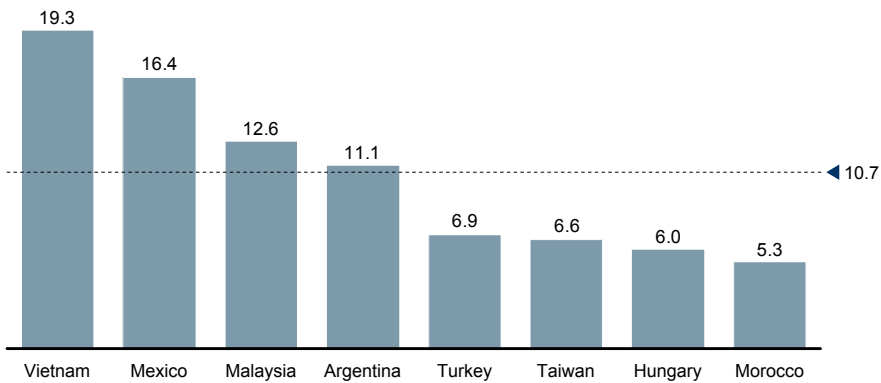
% (N = 2,484)

	Average stated revenue gains[2]	Average stated COGS reduction[3]	Anticipated stated ops/admin reduction[4]
Vietnam	9.4	6.8	8.3
Mexico	9.3	5.5	8.1
Argentina	7.4	2.8	5.1
Malaysia	6.2	3.7	6.1
Turkey	5.2	3.1	3.1
Taiwan	4.8	3.3	4.1
Morocco	3.3	3.3	3.2
Hungary	3.2	1.7	3.9
Average	**6.1**	**3.8**	**5.3**

1 Nigerian SME sector not surveyed, due to lack of survey resources there
2 Percent of respondents answering "Yes" to "Current performance linked to the Internet: Have Web technologies made it possible for your company to increase your revenue (to an extent that could not have happened through other channels or technologies)?" multiplied by the average stated impact.
3 Percent of respondents answering "Yes" to "Current performance linked to the Internet: Have Web technologies made it possible for your company to reduce your cost of goods sold (COGS)?" multiplied by the average stated impact.
4 Percent of respondents answering "Yes" to "Current performance linked to the Internet: Have Web technologies made it possible for your company to reduce expenses related to administrative, operational and general costs (including marketing expenses)?" multiplied by the average stated impact.
SOURCE: 2011 McKinsey survey of 2,484 SMEs across Argentina, Hungary, Malaysia, Mexico, Morocco, Taiwan, Turkey, and Vietnam; McKinsey analysis

Exhibit 11

McKinsey's SME survey found that productivity gains vary by country

Average stated productivity increase due to Web technologies
%

Country	Value
Vietnam	19.3
Mexico	16.4
Malaysia	12.6
Argentina	11.1
Turkey	6.9
Taiwan	6.6
Hungary	6.0
Morocco	5.3

◄ 10.7

SOURCE: 2011 McKinsey survey of 2,484 SMEs across Argentina, Hungary, Malaysia, Mexico, Morocco, Taiwan, Turkey, and Vietnam; McKinsey analysis

Web technologies are correlated with competition and market leadership in aspiring-country SMEs. The greatest Internet investments and gains occur in the most competitive markets. Similarly, market leaders dedicate the most resources for Internet technologies and reap the most in productivity gains. By their actions, SMEs in competitive markets across aspiring countries are likewise seeking to capture growth and profitability gains by enhancing Web capacity. Surveyed SMEs providing the most employees with access to mobile broadband access were usually in the most competitive markets. Similarly, SMEs in more competitive markets found higher productivity gains from the Internet than those SMEs in less competitive environments.

The economic impact on the SME sector has been positive in terms of creating jobs, too. We have found that the Internet created 3.2 jobs for every 1.0 job it reduced in the aspiring world—more than the 1.6 jobs created for every job lost in developed countries. These figures also align with statistics on the growth of the Internet in these countries (Exhibit 12).

Exhibit 12

The Internet globally creates more SME jobs than it destroys, with the greatest impact in BRIC economies and aspiring countries

Jobs created/reduced due to the Internet[1]
Number of jobs created per reduced job

Developed[2]	1.6
BRIC[3]	3.5
Aspiring[4]	3.2
All countries	3.1

Growth in broadband subscribers suggests similar findings[5]

Compound annual growth rate, 2007–09
%

Developed	BRIC	Aspiring
5.2	29.3	14.5
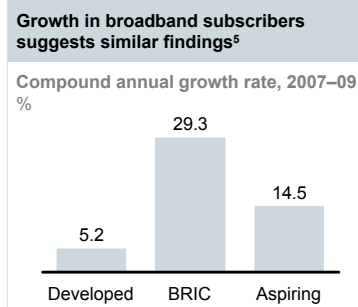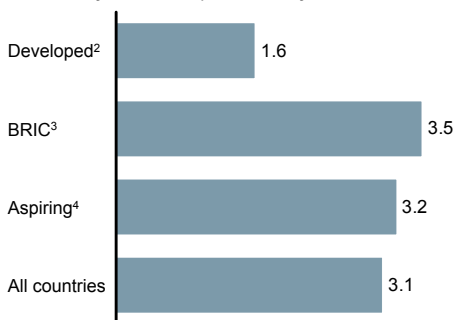
1 Respondents were asked: "What has been the net impact of the use of web technologies on your company's total number of employees?" Those answering "a reduction in the number of employees" or "the creation of jobs" were then asked, "Please estimate the creation/reduction in the number of employees relative to its level before (or without) your company's use of Web technologies."
2 Includes Canada, Germany, Italy, Japan, South Korea, Sweden, United Kingdom, United States.
3 Includes Russia, India, China. Data not available for Brazil.
4 Includes Argentina, Hungary, Malaysia, Mexico, Morocco, Taiwan, Turkey, Vietnam.
5 Based on broadband subscribers per 100 people.
SOURCE: 2011 McKinsey survey of ~7,000 SMEs; World Bank

6. Governments and the public sector are starting to offer better and more accessible public services through the Internet, but still have opportunity to go further

Governments influence Internet ecosystems in three ways: by enabling citizens' Internet accessibility and digital literacy; by setting the regulatory environment in which Internet ecosystems develop; and by providing e-government services. The governments of developed and aspiring alike focus on all three tasks using fairly similar methods, but a wide variance is observed in how and how completely each objective is met.

Governments can play a strong role in establishing widespread access to the Internet for their citizens. This can be done in two ways: first, governments can enable and/or

build the infrastructure needed for mobile or broadband, and second, governments can provide devices that enable Internet access. The United Arab Emirates provides free WiFi in public locations such as airports, reducing the cost of devices as a hurdle to Internet access. Argentina, through Programa Conectar Igualdad, has already provided almost two million free laptops to schoolchildren, reducing a big cost hurdle. Similarly, Saudi Arabia's Home Computer program, a public-private initiative, is seeking to bring one million PCs to homes across the country.

Digital literacy is a key hurdle in many aspiring countries, but it is eroding naturally, as young people grow up with Internet devices and consumer applications such as social networking. The literacy constraint is more of a concern for SMEs, whose adoption of the Internet continues to lag. Some programs, such as Hungary's Digital Renewal Action Plan, focus on spreading digital literacy. In Hungary's case, the target is 100,000 citizens in rural areas, where individual and business Internet use lags the most.

Regulatory environments, influenced by governments, can help Internet ecosystems to thrive (see Box 2, "Aspiring countries face obstacles to enhancing the impact of the Internet"). Where policy makers have supported competition and transparency, and provided rights of way and spectrum access without discrimination, they have helped level the playing field for all Internet businesses.

Box E2. Aspiring countries face obstacles to enhancing the impact of the Internet

The outlook for the Internet in aspiring countries is ripe with opportunity, but potential obstacles are also present, including inadequate Internet access, digital literacy, and regulatory and other policies.

Cost-effective Internet access is often beyond the reach of large segments of the population. Delivery of access at low cost is critically dependent on a robust mobile and/ or fixed-line Internet infrastructure and affordable device and connection costs. Even with these advantages in place some potential users in aspiring countries will not have the income necessary to access the Internet.

Facility in a language with significant content presence on the Web is an important hurdle for leveraging the Internet. Education matters—a lack of basic literacy inhibits even the use of free services such as online video that do not explicitly involve reading or writing. Digital literacy is an important second-order concern, as even many highly educated people do not know how to gain access to the Internet.

A range of policies can help or hinder Internet ecosystem development. Regulatory barriers and firewalls can impede the free flow of information, and well-intentioned and important controls on content and data management designed to keep the Internet safe for children, for example, can become restrictive in business operations.

Protectionist barriers can include blocking the ability of "foreign" companies to compete using the Internet. Such barriers can reduce the competitiveness of local companies. Consumers lose when competition is constrained, and we have found consumer surplus to be among the most important forms of Internet impact.

Policy makers in aspiring countries can enable Internet companies and entrepreneurs to thrive in local markets by lowering barriers to registering a business, or easing access to capital. Some countries have done this through government-funded venture capital organizations. Morocco's Maroc Numeric Fund, for example, focuses on providing first-round capital to Internet start-ups.

Aspiring countries can also invest in making their countries a core part of the global supply chain of Internet-related goods and services. From Morocco's Rabat Technopolis to Dubai's Internet City, aspiring countries are positioning themselves as low-cost manufacturing hubs for ICT goods, with governments promoting clusters of both manufacturing and innovation. Malaysia's Multimedia Super Corridor is one example. Another is Taiwan's Industrial Technology Research Institute. Such investments are often made to anchor a larger ecosystem populated by domestic and multinational private firms. National universities with an ICT focus can also play this anchoring role, especially when governments step in to promote relationships between academic research and the private-sector R&D environment.

Beyond setting policy and promoting Internet ecosystems, governments can use the Internet to provide better services for their citizens. In the aspiring world, e-government services are just getting started, but plenty of growth and innovation has been observed, especially in the "m-government" space.

The Internet creates an opportunity for governments to: (1) deliver convenient and transparent services for their citizens; (2) achieve cost savings for the government; (3) achieve cost savings for citizens and businesses; and (4) generate revenue for the government. While developed countries often have robust e-government offerings, aspiring countries vary widely in what government services are provided online.

Many aspiring countries have started to provide information to citizens online. The development and execution of transactional services require a higher level of technical sophistication, and such services are more the hallmark of mature Internet ecosystems than nascent ones. Nevertheless, examples of successful transactional e-government services in aspiring countries exist. Hong Kong's Information Technology and Broadcasting Bureau, for example, has increased efficiency in the government by reducing processing costs from $1.90 per transaction at the counter to $0.80 online.

However, so far only a small fraction of online users in aspiring countries have access to e-government services. If e-government services were offered in aspiring countries at the level of availability and sophistication they are in developed countries,[20] their number of online users could reach 327 million (or one-third of all present-day online users in aspiring countries). Among the actions needed to achieve this level of sophistication would be considerable government investments in developing online offerings (e.g., driver's licenses, tax forms and filings, online education offerings), while more citizens become digitally literate and Internet penetration increases. The penetration need not be PC-based, as aspiring countries are innovating in m-government services to serve their many citizens whose Internet access is through mobile devices.

The role aspiring-country governments can play in enabling Internet impact varies from country to country. Some governments foster Internet ecosystem development through infrastructure investment and regulation e.g., the United Arab Emirates; others actively nurture Internet usage through lower access costs and digital literacy programs, e.g., Hungary; and some promote Internet ecosystem health with innovative e-government services, e.g., Taiwan.

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20 As measured by the United Nations' E-Government Development Index, the UN's ranking system, from 0 to 1, is used to indicate the level of maturity of e-government services, with variables including policy, infrastructure development, and mobile solutions. United Nations, "e-Government survey 2010."

7. Aspiring countries can leverage their distinct characteristics to drive the development of Internet ecosystems

Each aspiring country has a different set of macroeconomic characteristics that can be leveraged to build more robust Internet ecosystems. For those aspiring countries that are embarking on a journey to create their own successful Internet ecosystem, the experiences of their predecessors are germane, and can be drawn upon for useful lessons. Because each aspiring country is unique, we expect different paths will be followed, but the potential benefits from a more digitized society are many and obvious.

We have identified five major macroeconomic attributes that characterize an economy. Most countries possess one or more of these attributes, which include natural resources, global position as a hub of trade, potential for innovation, strong local consumption, and a strong SME sector.

1. **"Resource-rich"** countries that extract highly profitable natural resources (e.g., oil, natural gas) often have the capacity to invest and build Internet infrastructure and other foundational elements, e.g., digital literacy, and make it possible for their citizens to access the Internet. Some countries in our aspiring group are already doing this and investing in mobile or broadband infrastructure, or promoting device access and digital literacy through government-funded or supported programs, e.g., Argentina.

2. **"Hub-of-trade"** countries with a highly developed export economy can invest in ICT-enablement for their enterprises and attract multinational ICT manufacturers to their trade centers, e.g., Vietnam. Countries that are already hubs of ICT manufacturing and export can then create ICT parks focused on innovation, with research institutes, investment firms, and private companies, in an effort to move up the value chain, e.g., Malaysia.

3. **"Innovation-potential"** countries investing significant resources in R&D benefit from large pools of highly educated and creative individuals who can develop new products, e.g., Hungary. Such countries can focus on developing bridges between ICT and Internet-related research facilities and companies, providing access to financial capital to innovative Internet products and ideas, and facilitating the process of starting a business for their newly digitally literate human capital.

4. **"Strong-local-consumption"** countries are heavily reliant on domestic production and consumption as a share of their economy, e.g., Turkey. In such countries, Internet household penetration, higher usage and the enablement of commerce platforms for e-commerce can be promoted to help businesses better address domestic consumer demand. Here Internet-related goods and services may further unlock Internet ecosystem benefits.

5. **"Strong-SME-sector"** countries are those where SMEs employ a large share of the workforce, e,g., Poland. Such countries can benefit from development of broadband infrastructure for SMEs and steps to lower the cost of hardware and Internet access.

The economies of most aspiring countries are composed of a mix of these five characteristics, and in promoting their Internet ecosystems they can rely on one or another or a combination, capturing the advantages that flow from them. Developing, forming, and committing to a path of Internet ecosystem enhancement will require participation from all stakeholders in aspiring countries (see Box 3, "All key stakeholders can do a great deal more to unlock the economic and social impact of the Internet"). The rewards, however, are potentially immense, as the experience of the developed economies demonstrates.

Box 3. All key stakeholders can do a great deal more to unlock the economic and social impact of the Internet

Governments can support the development of the foundations of the Internet ecosystem by promoting open access to the Internet, low Internet access costs, broad Internet coverage and digital literacy. To support innovation and entrepreneurship, the educational system must connect with the R&D environment. Governments can even establish innovation hubs. Policy makers also have a role in enabling Internet companies and entrepreneurs to thrive in their local markets. This role includes supporting competition and transparency, and providing rights of way and spectrum access without discrimination. To help bridge the domestic Internet ecosystem to the global one, and ensure that local businesses are globally competitive, policy makers can support international standards and facilitate data transfers.

Enterprises have much to gain from a robust Internet ecosystem. To capture these benefits, enterprises can invest in Web technologies themselves and train their employees to leverage them, too. They can also support local education and digital literacy efforts, even in partnership with local governments. Public-private partnerships can help bring infrastructure to far-flung regions, technology-based solutions to local problems, and even help local businesses become micro-multinationals.

Entrepreneurs can develop innovations that address local constraints and allow Internet ecosystems to leapfrog up the Internet development curve. These innovations can promote Internet use in a self-reinforcing cycle. Examples of these efforts are described in this report; they include innovative cashless payment solutions, marketing through social networks, and various online sales and buying platforms. Each of these successful solutions promotes Internet use, which in turn can enable further adoption of these solutions.

Individuals can drive the positive impact of the Internet in aspiring countries by not only continuing to adopt and use Internet-based products and services, but also by applying the principles of good citizenship and civil society to online behavior. This includes respecting rightful laws and others' privacy, and supporting civic organizations and dialogue.

Case example: The impact of Internet technologies— Search

This white paper was written as joint research project with Google and was published in *The McKinsey Quarterly* online, June 2011. All rights reserved.

For billions of Internet users, a world without search engines that help them navigate through the plethora of pages, images, video clips, and audio recordings found on the World Wide Web would be unimaginable. In addition to the trillions of online searches made annually, and the billions of dollars advertisers pay to appear on search pages, the economic value of algorithmic search contributing to Internet-wired economies is much more than the revenue generated by search providers, and currently exceeds USD1 trillion a year worldwide.

Dr. Jacques Bughin, Dr., Michael Chui, Laura Corb, Dr. James Manyika, Borja de Muller Barbat, Olivia Nottebohm, and Rémi Said

Executive summary

For billions of people around the world, the Internet has become an essential component of their everyday social and business lives. And though they seldom give it a moment's thought, the search engines that help them navigate through the plethora of pages, images, video clips, and audio recordings found on the World Wide Web have also become essential. Search technology—shortened simply to "search" in the IT world and referred to as such in the rest of this report—is only two decades old, but it is a cornerstone of the Internet economy.[1]

The numbers prove its utility. In 2010, an average Internet user in the United States performed some 1,500 searches, while some 1.6 trillion searches a year are conducted globally.[2]

Few attempts have been made to assess the value of all this activity. Various reports point to the large amount of money advertisers spend to appear prominently on search pages as an indication of its worth. The profits of those that provide search services—portals, search engines, and search platforms—are another indication. Yet no study has comprehensively assessed the benefits and value of search. This report aims to rectify that, showing how search creates value and who benefits. Where possible, it quantifies the value created. Among our key findings:

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1   Search Engine History: http://www.searchenginehistory.com/.
2   ComScore qSearch.

- Most work to date has identified three sources of search value: time saved, price transparency, and the raised awareness harnessed by advertisers. Though these are important, they only partially capture the ways in which search creates value, and so underestimate its worth considerably. We identified six more sources of value, and there will undoubtedly be others as search continues to evolve.

- A conservative estimate of the global gross value created by search was $780 billion in 2009. Across the five countries studied, only 4 percent of the gross value created by search was captured by the search industry.

- Worldwide, some 65 percent of search value flowed directly through to GDP in 2009, though the split between developed and developing countries was uneven. Seventy percent of total search value contributed to GDP in the developed countries in the study—the United States, France, and Germany. An average 40 percent contributed toward GDP in the two developing countries in the study—Brazil and India. Put another way, search contributed to between 1.2 and 0.5 percent of GDP in the five countries studied.

- Between 30 and 65 percent of the value of search accrued to individuals rather than companies. In emerging countries such as Brazil and India, people—that is, information seekers and consumers—capture the biggest proportion of the value created by search relative to companies.

- The return on investment (ROI) for those that deploy search are high. Advertisers do well, earning an average ROI of 7:1. Other constituencies fare better still. Based strictly on the value of time saved, individuals in our study—that is, individual information seekers and content creators, consumers, and entrepreneurs—earn an ROI of 10:1 on average. Enterprises earn still more, with an ROI of 17:1 as a result of time saved.

- Despite the clear, measurable benefits of search to the economy, it would be a mistake to think about search only in terms that are easy to quantify. For example, search helps people find information in times of emergencies and helps them seek out people with similar interests—perhaps a support group for those coping with disease. Search also shifts the balance to empower individuals or small organizations with something to share that would otherwise reach only a small audience. None of these types of benefits may be easy to measure, but they are powerful nevertheless.

- There are, of course costs associated with search. Though we do not examine them deeply in this report, we do recognize potential negative impacts, particularly for individual businesses, e.g., many of the gross benefits come at the expense of other companies, or potential losses where search facilitates piracy or undermines intellectual property protection.

- Search continues to evolve rapidly as a result of changes in user behavior; the content that is searchable; search technology; where search occurs—for example, within social networks and on new devices; and the arrival of new participants in the search market.

Search scale

The size of search can be hard to conceive. More than one trillion unique, worldwide URLs were indexed by Google alone by 2010.[3] Some 90 percent[4] of online users use search engines, and search represents 10 percent of the time spent by individuals on the Web, totaling about four hours per month.[5] Knowledge workers in enterprises spend on average five hours per week, or 12 percent of their time, searching for ontent.[6] The list could go on. People and organizations are in love with the utility of search.

In retrospect, it was inevitable that search would become so big. The power of Moore's and Metcalfe's laws[7] meant that it became easy and cheap to capture, digitize, and store massive amounts of information; the explosive growth of Internet usage meant the creation of still more Web content; and the efficiency of online transactions lured commerce and business online. As a result, a mechanism for discovering and organizing Internet information became imperative, and search was born. Users could now find what they wanted, and providers of information, products, and services could locate the right audience at negligible cost, encouraging still more content.

But the way people search has since added another dimension to its utility. When people search online, they are signaling information about themselves: what they are looking for, when, and in what context—for example, the Web page they visited before and after the search. Such information can be harnessed by those seeking to deliver more relevant content or advertising, often a source of value to providers and search users alike, though it is this dimension that also raises debate about privacy.

How should one think about the value of all this search activity? Often, it is considered in terms of the profits made by the search industry—that is, those that provide search capabilities and search marketing services. A very rough estimate of the industry's profit margins[8] would indicate that, in the United States, an average search is worth three cents in profit to these companies. Yet the figure comes nowhere near to capturing a sense of the real worth of search if you consider even for a moment the very different ways in which individuals and organizations use it. Much more value is being created in the "search value chain" and captured by market participants outside of the search industry.[9]

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3   http://googleblog.blogspot.com/2008/07/we-knew-web-was-big.html [Retrieved April 29, 2011].

4   ComScore qSearch.

5   McKinsey & Company for IAB Europe, *Consumers driving the digital uptake: The economic value of online advertising-based services for consumers,* September 2010.

6   The hidden costs of information work, IDC white paper, March 2005, corroborated by McKinsey primary research.

7   Moore's Law, first described by Intel cofounder Gordon Moore, states that the number of transistors that can be placed on an integrated circuit doubles approximately every two years. In other words, the amount of computing power that can be purchased for the same amount of money doubles about every two years. Metcalfe's Law, attributed to Ethernet inventor Robert Metcalfe, states that the value of a telecommunications network is proportional to the square of the number of connected nodes in the system.

8   Typically, Internet search engines and classified search generate profit margins in the range of 20 to 40 percent, and search engine optimization (SEO) companies generate 10 to 20 percent profit margins (based on McKinsey analysis of returns from public companies in 2008).

9   Profits by search industry are BOTH an over and underestimate of search's value: some profits come at expense of other media; much of value does not convert to profit, e.g., value that accrues to consumers and other businesses.

How search unlocks value

Most literature to date has looked at and quantified only three ways in which search creates value: by saving time, increasing price transparency, and raising awareness.

Our research suggests this underestimates value creation from search, because there are additional sources of value. Some of these can be estimated in financial terms. Others cannot, either because they are difficult to measure or because they create value to society that may not have direct financial worth. For example, it is hard to gauge the value of search, financial or otherwise, to students in developing economies who find course materials made available online by world-class universities.

In all, we identified nine sources of search value:

- **Better matching.** Search helps customers, individuals, and organizations find information that is more relevant to their needs.

- **Time saved.** Search accelerates the process of finding information, which in turn can streamline processes such as decision making and purchasing.

- **Raised awareness.** Search helps all manner of people and organizations raise awareness about themselves and their offerings, in addition to the value of raised awareness from an advertiser's perspective that has been the focus of most studies.

- **Price transparency.** This is similar to "better matching" in that it helps users find the information they need, but here, the focus is on getting the best price.

- **Long-tail offerings.** These are niche items that relatively few customers might want. With the help of search, consumers can seek out such offerings, which now have greater profit potential for suppliers.

- **People matching.** This again entails the matching of information but this time focusing on people, be it for social or work purposes.

- **Problem solving.** Search tools facilitate all manner of problem solving, be it how to build a chair, identify whether the plant your one-year-old has just swallowed is poisonous, or advance scientific research.

- **New business models.** New companies and business models are springing up to take advantage of search. Without search, many recently developed business models would not exist. Price comparison sites are a case in point.

- **Entertainment.** Given the quantity of digital music and video available, search creates value by helping to navigate content. For a generation of teenagers who pass on TV to watch videos on YouTube instead, search has also enabled a completely different mode of entertainment.

This list is not exhaustive—and there are other sources of value that result from the nine above, e.g., lowering production costs, and speeding innovation, through better matching.

The value of search: Who benefits and how?

Search affects the activities of individuals and all sorts of organizations, so we cast our research net wide when trying to assess its value. We wanted to look at its impact on businesses, individuals, and public service entities, and so we examined 11 constituencies within these main groups—for example, advertisers and retailers in business, and health care and education in public services—analyzing how the nine sources of value affected each.

The results should be regarded as case studies that demonstrate the value of search rather than as a fully exhaustive analysis. If the task of quantification was too uncertain for some sources of value—such as calculating the value of better matching for retailers—or if the value was likely to be minor, it was not included in our analysis.

The study showed that value accrues to all constituencies. The three most-studied sources of search value—time saved, raised awareness, and price transparency—are important. However, the study illustrated the additional impact of the other six sources of value, emphasizing the extent to which previous views of how search creates value have been too narrow. Exhibit 1 describes the sources of value for each constituency.

Here are some examples of how the different constituencies benefit from search:

- The value of search to retailers was estimated in 2009 at 2 percent of total annual retail revenue in developed countries and 1 percent in developing ones. That is equivalent to $57 billion to $67 billion in the United States and $2.1 billion to $2.4 billion in Brazil.[10]

- Search-enabled productivity gains enjoyed by knowledge workers in enterprise were worth up to $117 billion in 2009 in the five countries studied. The figures ranged from $49 billion to $73 billion in the United States to $3 billion to $4 billion in Brazil.[11]

Exhibit 1

Primary sources of value from search

Constituencies	Better matching	Time saved	Raised awareness	Price transparency	Long-tail offerings	People matching	Problem solving	New business models	Entertainment
Advertisers	■		■						
Retailers	■		■	■	■			■	
Entrepreneurs	■	■	■	■		■		■	
Content creators	■		■		■			■	
Enterprise	■	■				■	■		
Consumers	■		■	■		■			
Individual content creators									■
Individual information seekers	■	■				■	■		■
Health care	■		■	■					
Education	■		■			■	■		
Government	■	■	■						

SOURCE: McKinsey analysis

10 Estimated based on three methods: the methodology in Hal R. Varian, "Online ad auctions," American Economic Review: Papers & Proceedings 2009, Volume 99, Number 2, pp. 430–34; McKinsey primary research in its digital marketing survey in 2007; and comScore and Nielsen data on total searches with an applied conversion rate.
11 Estimated based on 10 to 15 percent productivity gain for knowledge workers in each country; number of knowledge workers based on International Labor Organization figures for France and Germany and McKinsey estimates; hourly wages based on IDC data.

- We calculated that the value created for consumers was worth around $20 per consumer per month in France, Germany, and the United States in 2009, and $2 to $5 in India and Brazil.

- Depending on geography, 30 to 60 percent of all Internet users—that is, some 204 million people in the five profiled countries—create their own content.[12] The shares are higher in developing countries than in developed countries. It is hard to measure the value of search to these people, to the extent it helps make their voices heard. However, the sheer number of those who create content to express themselves in one way or another helps explain the power of social networks to influence social dynamics around the globe.

The economic value of search

Just how much is search worth? To date, no one has looked at its economic contribution at a country level, let alone a global level.

The analysis showed that search activity had measurable impact approaching gross annual value of $780 billion in 2009,[13] similar to the GDP of the Netherlands or Turkey,[14] and making each single search worth around $0.50.[15] It should be remembered that this is only a partial estimate of the gross value of search, limited as our research was in terms of the number of constituencies and sources of value analyzed. In addition, the speed at which the search environment grows makes it likely that this figure has already been surpassed. Exhibit 2 shows how the value was divided among the five countries studied.

Exhibit 2

Gross value created by search across countries, 2009
USD billions
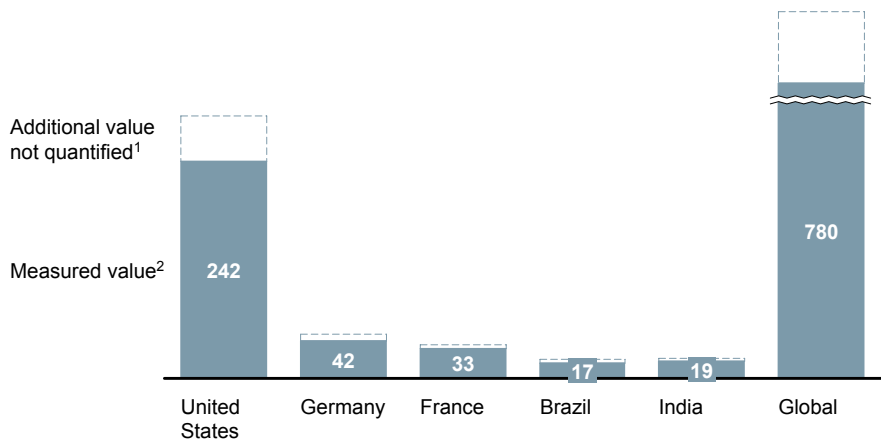
ESTIMATES

Additional value not quantified[1]

Measured value[2]

United States	Germany	France	Brazil	India	Global
242	42	33	17	19	780

1 These are only estimates and should not be taken out of context of the accompanying text.
2 These values are conservative. They include only quantified estimates and do not include value that we did not quantify, such as the improvement in the quality of a consumer's shopping experience from better matching.
SOURCE: McKinsey analysis

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12 eMarketer.
13 Estimated in 2009 dollars, calculated by applying average percentage of GDP attributed to search of France, Germany, and the United States to all developed countries and average percentage of GDP attributed to search to all emerging countries; McKinsey analysis. Note that this gross annual value includes value that is not captured in GDP statistics (e.g., consumer surplus), and that the portion that is captured in GDP statistics includes both the direct contribution of Internet sales and the indirect contribution of offline sales influenced by the Internet.
14 International Monetary Fund.
15 ComScore qSearch estimates 1.6 trillion searches conducted per year.

Not all of this value shows up in GDP[16]—e.g., many consumer benefits, such as lower prices or the time consumers save, are not captured in these numbers. Some of these are likely to have an indirect impact on GDP. Some sources of value in education and health care that we did not quantify also boost GDP indirectly. The estimate of GDP impact should therefore be taken as conservative. It is nevertheless significant. The research showed gross value of $540 billion, or 69 percent of the measurable value, flowing through to GDP. This is roughly the nominal size of the global publishing industry in 2010[17] or Switzerland's GDP in 2010.[18]

Exhibit 3 shows that this represents between 0.5 and 1.2 percent of GDP in each of the countries studied.

Exhibit 3

Value created by search across countries, 2009   ESTIMATES
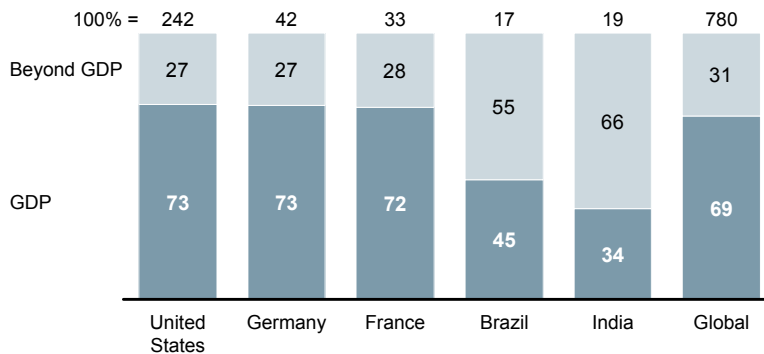
Measured value
%; USD billions

100% =	242	42	33	17	19	780
Beyond GDP	27	27	28	55	66	31
GDP	73	73	72	45	34	69
	United States	Germany	France	Brazil	India	Global

Contribution to GDP[1]
%

1.2%	0.9%	0.9%	0.5%	0.5%

1 Represents only the portion of value that is attributable to GDP (e.g., the 73% of $242 billion in the United States).
SOURCE: McKinsey analysis

The difference in the extent to which search contributes to GDP in developed and developing countries—around 70 percent and 40 percent, respectively—can be explained by the much larger percentage of total value that is captured in developing countries as a consumer surplus, which is not included in GDP. This is reflected in Exhibit 4, showing that in the developed countries studied, individuals capture around 30 percent of measurable search value. In developing countries, the figure is around 60 percent. The exhibit also indicates the extent to which search value is underestimated if the gauge to profits earned by the search industry is narrowed. Only 4 percent of the value measured is captured by that industry globally.

Despite the clear benefits of search to the economy, it would be a mistake to think about search only in monetary terms. Search assists people in myriad ways in their daily lives. It helps them to find information in times of emergencies, for example, and to seek out people with similar interests—perhaps a support group for those coping with disease. Importantly, it also shifts the balance to empower individuals or

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16   We estimated GDP impact using an income approach.
17   Global Insights, Q2 2011 forecast. Includes publishing of books, brochures, musical books, newspapers, journals and periodicals, recorded media, and other publishing.
18   International Monetary Fund.

small organizations with something to share that would otherwise reach only a small audience. None of these may have economic value, but they affect people's lives.
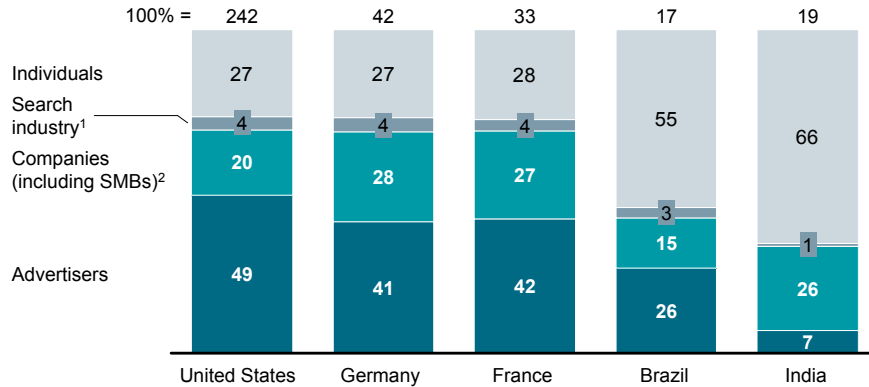
Exhibit 4

Value created by search across countries, 2009
ESTIMATES

Measured value
%; USD billions

	United States	Germany	France	Brazil	India
100% =	242	42	33	17	19
Individuals	27	27	28	55	66
Search industry[1]	4	4	4		1
Companies (including SMBs)[2]	20	28	27	3	26
				15	7
Advertisers	49	41	42	26	

1 Search industry includes enterprise search, classified and local search, and search marketing.
2 SMBs = Small and medium-sized businesses.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey analysis

The future of search

The future of search remains hard to predict given the pace of change, but the value of search will only grow as we come to rely upon it more and more.

Search is at an early stage of its evolution. Searches for video or photographic images still largely depend on text searches by file names or key words, not image searches, for example, and technologies capable of capturing an image or sign in one language and translating it into another remain rudimentary. All this is work in progress.

But search's main challenge going forward will be to keep pace with what it has helped unleash, namely more and more online content: one study estimated that the amount of digital information will grow by a factor of 44 annually from 2009 to 2020.[19] Amid the trillions of gigabytes, the task of search technology will be to make sure the search is still quick and the results relevant.

Accordingly, the use of vertical search engines is on the rise. Ten times as many product searches are now executed on Amazon and eBay, both vertical sites, as on Google Product Search,[20] for example. Interest in semantic search engines, which try to understand more accurately the underlying intent of a search, also is on the rise.

19 IDC Digital Universe Study, sponsored by EMC, May 2010,
    http://www.emc.com/about/news/press/2010/20100504-01.htm.
20 ComScore qSearch.

Importantly, relevant search results are increasingly deemed to be personalized. Autonomous search agents that make suggestions based on personal data, including the user's location, metadata, and more advanced algorithms, are in sight, and key players in the search industry now use the data available on social networks to enhance search results. Some 30 percent of US Internet users now use social networks to find content, and 21 percent use them to find videos.[21]

The advent of smartphones, tablets, and other Web-connected portable devices also increases the potential of more personalized searches. And as search continues to grow, new applications will emerge. Already, analysis of what people are searching for is being used to better understand current trends and future outcomes in society. Researchers have, for example, looked at how search activity can help predict epidemics, unemployment, consumer demand, or even stock prices.

So what does all this mean for all those who participate in the search market?

Both individuals and organizations have much to look forward to. They will be able to search more quickly and more easily than before, and they can expect increasingly relevant results. But participants in the search industry are in for a turbulent ride. The competition is fierce, and as technology change accelerates, incumbents will be constantly challenged and disruptive change will become the norm.

Policy makers will also find themselves challenged as search gives rise to a whole host of issues that are difficult to arbitrate, given the ease with which information can be accessed through search. Privacy often grabs attention. But other salient issues include copyright and trademark infringement as well as censorship,[22] making search one of the toughest issues confronting technology policy. Any attempt by policy makers to arbitrate the interests of the different parties in the fast-paced, virtual world will likely leave them playing catch-up.

Researchers, too, will lag behind, trying to make sense of it all. But amid all the uncertainty, one thing is sure: the full implications of search on economies and societies are only now beginning to be revealed.

Search scale

For billions of people around the world, the Internet has become an essential component of their everyday social and business lives. And though they seldom give it a moment's thought, the search engines that help them navigate through the plethora of pages, images, video clips, and audio recordings found on the Web have also become essential. Search technology—shortened simply to "search" in the IT world and referred to as such in the rest of this report—is only two decades old, but it has become a cornerstone of the Internet economy.

People and organizations are in love with its utility. In January 2011, 200 million Americans, 40 million French, and more than 50 million Germans conducted online searches.[23] More than 1.6 trillion searches a year are currently conducted globally.[24]

21   eMarketer 2009.
22   Hannibal Travis, "The future according to Google: Technology policy from the standpoint of America's fastest-growing technology company," *Yale Journal of Law & Technology,* Spring 2008–09, Volume 11.
23   ComScore qSearch.
24   ComScore qSearch.

And consider the following:

- By July of 2008, more than one trillion unique URLs were indexed by Google,[25] the number having grown by 44 percent[26] annually during the preceding ten years. The growth of other major search engines such as Bing and Yahoo! is similarly large.

- Some 90 percent[27] of online users use search engines—that means 1.7 billion people.[28]

- Search represents 10 percent of the time spent by individuals on the Web, totaling about four hours each a month.[29]

- Approximately 25 percent of the traffic to the Web sites of mainstream content creators results is referred by search engines.[30]

- Knowledge workers in enterprises spend on average five hours per week, or 12 percent of their time, searching for content.[31]

- Depending on the geography, 30 to 60 percent of all Internet users post content online, in the knowledge that search will help ensure that their voices are heard. That is more than 200 million people in the five profiled countries.[32]

People use search in all aspects of their lives. (See Box 1, "Search scope," for a definition of how search is defined for the purposes of this report.) Worldwide, by early 2011, some 38 percent of searches were work-related, up from 34 percent the previous year.[33] To many workers, including lawyers, investors, managers, entrepreneurs, doctors, educators, and journalists, search has become indispensible. A survey of biology teachers in the United States, for example, found that 90 percent used search engines to find presentation materials such as photos, audio, and other curriculum content and that 80 percent used them to plan daily lessons.[34]

The use of search outside of work also continues to grow, though less quickly, and is the starting point for many Web activities. For example, 82 percent of US Internet users start with a search engine when they look for public information or complete a transaction with a governmental entity, while 80 percent use a search engine as a starting point for health queries.[35]

All of this search activity takes place in a world where only around 30 percent of the population has Internet access[36]—though lack of access is not always an impediment to be able to search. Justdial is an Indian company that enables users to phone and ask an operator to conduct a search on their behalf, overcoming access as well as literacy problems. Justdial receives some 250,000 phone calls and conducts more than 210,000 Web searches each day.

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25   The Official Google Blog, July 26, 2008.

26   The Official Google Blog, July 26, 2008 (data from 1998 to 2008).

27   ComScore qSearch.

28   ITU World Telecommunication/ICT Indicators database.

29   McKinsey & Company for IAB Europe, *Consumers driving the digital uptake: The economic value of online advertising-based services for consumers,* September 2010.

30   McKinsey US clickstream data, 2009.

31   The hidden costs of information work, IDC white paper, March 2005, corroborated by McKinsey primary research.

32   eMarketer.

33   ComScore qSearch.

34   Anne Marie Perrault, An exploratory study of biology teachers' online information-seeking practices, American Association of School Librarians, 2009.

35   Pew Internet and American Life Project, 2010.

36   International Telecommunication Union data on Internet usage, http://www.itu.int/ITU-D/ict/statistics/; population data from the World Bank, http://data.worldbank.org/data-catalog.

Box 1. Search scope

Search is defined broadly. It includes any online search activity using general, horizontal Web search engines, such as Google and Yahoo!, and specialized, vertical ones, such as Amazon or YouTube. It also includes consumer searches and those conducted by people in businesses. It covers searches of all types of media, including text, images, and video, and through any type of device, including personal computers and mobile devices such as smartphones. Currently, about a third of all searches are done at work, while the daily number of vertical searches conducted in the United States already exceeds the daily number of searches performed on any single, major, horizontal Web search engine such as Google or Bing.[1] Thus the need to define search broadly. However, we do not include in our estimates of search the impact of pure recommendations from other users or simple browsing (i.e., following links not generated by entering search terms) through a Web site.

Most analysis of the value of search has concentrated on the US market. This report includes four more countries—Brazil, France, Germany, and India—to give a view of how search might vary depending on geography and economic circumstances. The United States, Germany, and France can be considered leading-edge countries in terms of Internet accessibility and usage. India and Brazil are examples of up-and-coming economic powers where a relatively small segment of the population is currently active online. Adding search activity in Brazil, France, Germany, and India to that in the United States more than doubles the sample size of searches.

The report also includes mobile phone searches and those conducted on other mobile devices such as tablets.

Finally, we have assessed the value of search for a relatively large set of constituencies, including individuals and organizations, and examined a wide range of sources of value. Much previous research has focused on providers of search services, particularly advertisers. Yet our analysis suggests that search advertising accounts for less than 40 percent of the total value derived from search.

The research was conducted in the first quarter of 2011.

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1   ComScore qSearch.

In retrospect, it was inevitable that search would become so powerful, given the forces at work. First, the power of Moore's and Metcalfe's laws[37] meant it became easy and cheap to capture, digitize, and store information. Second, the explosive growth of the Internet in terms of reach and usage generated still more users and content. And third, the efficiency of online transactions and the exchange of information and content lured commerce and business onto the Internet.

As a result of these forces, users needed a mechanism for finding and discovering information on the Internet. Early attempts to impose some order on it all mimicked the physical world in the form of online directories and catalogs, though these were soon overwhelmed by the scale and dynamism of online information. And so online search was born. (See Box 2, "A history of search.") Users could now find what they wanted, while providers of information, products, and services—be they individuals or organizations—could locate the right audience at negligible cost.

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37   Moore's Law states that the number of transistors that can be placed on an integrated circuit doubles approximately every two years. Metcalfe's Law states that the value of a telecommunications network is proportional to the square of the number of connected nodes in the system.

Box 2. A history of search

Search had its conceptual beginnings in the 19th century, when pioneers such as Belgian Paul Otlet pondered how to collect and organize the world's knowledge. In 1895, Otlet began a classification system using index cards, a system that was to become ubiquitous in libraries around the world. He hired a staff whose job was to read books, write the facts on the index cards, and cross-reference them. The filing cabinets in his warehouse were stuffed with more than 15 million index cards before many were destroyed in World War II, but he had a grander vision still that presaged today's search capabilities. He sketched out plans for a system in which people would be able to search through millions of interlinked documents and images from a great distance through what he envisaged as "electric telescopes." He described how people would use the devices to send messages to one another, share files, and even contribute to social networks—able to "participate, applaud, give ovations, and sing in the chorus." He called the whole thing a "réseau," or network, whereby "anyone in his armchair would be able to contemplate the whole of creation."[1]

Fast forward to 1969 and ARPANET, the network sponsored by the US military's Defense Advanced Research Projects Agency for computers to communicate with each other, and the core of what became the global Internet. Over time, the nodes on the network became thousands of large computers. And as other, similar data networks emerged around the world, and as they were hooked up to a much larger, collective Internet, it became increasingly difficult for people to find information.

The problem got worse when the Internet went mainstream with the development of the "World Wide Web" in the early 1990s. Before then, the Internet was mainly the province of scientists and researchers who did not regard it as a mass medium. It made the transition when a set of standards was created and a new class of easy-to-use applications called "Web browsers" was developed. These included the ability to easily display images as well as text and to follow links between pieces of content.

To cope with the subsequent proliferation of content, many hierarchical directories of information were developed, such as Yahoo!, which debuted in 1995, in which information was maintained and edited manually. Computer scientists soon began to develop automated ways to locate specific information on the Web—the needle in a haystack of hundreds of thousands of institutional computers, and tens of millions of smaller servers and personal computers that had become part of this fast-growing network. Search tools became a necessity for such an enormous network to be usable.

Most algorithmic search engines work more or less the same way: they employ software robots that "crawl" through the text of Web pages and index where particular words or groups of words show up. Many engines based on this technology, including WebCrawler, Lycos, AltaVista, and Excite, emerged in the mid-1990s, often combined with directories. In addition, online companies such as Amazon and eBay built internal product search algorithms that focused on their own universe of items, sellers, and customers.

Google's search engine had its origins in 1996, as a graduate student project at Stanford University. What made it different from other Web-indexing engines was that it also analyzed how many other Web pages linked directly to a page that included the search terms. The idea behind this analysis, dubbed PageRank,[2] is that the more a page is linked to by other pages, the more relevant other users find it. Thus, search engines aggregate

1   Alex Wright, "The Web time forgot," New York Times, June 17, 2008,
     http://www.nytimes.com/2008/06/17/health/17iht-17mund.13760031.html
2   Sergey Brin and Lawrence Page, The anatomy of a large-scale hypertextual Web search engine,
     Proceedings of the Seventh International Conference on World Wide Web (WWW), Brisbane, Australia,
     1998, pp. 107–117, http://dbpubs.stanford.edu:8090/pub/1998-8.

Box 2. A history of search (continued)

and leverage the collective votes of millions of Web page creators each time they provide a link to a particular page as a source of information on a particular topic. Consequently, it ranks higher in the search results.

The term "social search" began to emerge around 2004. Results from a social search give more visibility to content created or touched by other people, especially those in a user's network, perhaps because it has been bookmarked or tagged, for example. This means it is likely to be more relevant to the user. Services such as del.icio.us and Reddit aggregate the "social bookmarks" from large numbers of people to suggest content. Users are increasingly navigating to Web sites from links on social networks, a role that search engines had traditionally dominated (see Exhibit 5). Algorithmic search engines are now starting to incorporate social cues—for example, information about content that users have tagged—into their relevance-ranking algorithms.

Exhibit 5

Value created by search across countries, 2009   ESTIMATES

Measured value
%; USD billions

	United States	Germany	France	Brazil	India
100% =	242	42	33	17	19
Individuals	27	27	28	55	66
Search industry[1]	4	4	4		
Companies (including SMBs)[2]	20	28	27	3	1
				15	26
Advertisers	49	41	42	26	7

1   Search industry includes enterprise search, classified and local search, and search marketing.
2   SMBs = Small and medium-sized businesses.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey analysis

But users' online behavior has since added another dimension to its utility. When people search online, they are signaling information about themselves: what they are looking for, when they are looking, and in what context—for example, the Web page they visited before and after the search. Such information can be harnessed by those seeking to deliver more relevant content or advertising, often a source of value to providers and searchers alike. This dimension also raises concerns about privacy. Some research has been conducted into the value users put on their privacy—that is, how much they might pay to protect their online information.[38] (Given that privacy issues are extensively discussed elsewhere, they are not the focus of this report.)

How should one think about the value of all this search activity? Most often, it is considered in terms of its value to the search industry—that is, enterprise search, classified and local search, and search marketing. Together, these three segments earned estimated revenue in 2010 of some $20 billion in the United States and $40 billion

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38   McKinsey & Company for IAB Europe, Consumers driving the digital uptake: The economic value of online advertising-based services for consumers, September 2010.

worldwide.[39] (See Box 3, "The money in the search industry.") A very rough estimate of their profit margins[40] would indicate profits of about $8 billion for US search companies. Divide this by the number of search queries in the United States that same year (about 270 billion), and the profit per query is worth about three cents to these companies.

Yet this comes nowhere near to capturing a sense of the real worth of search if you consider even for a moment the very different ways in which individuals and organizations use search and why they value its utility. Much more value is created in the "search value chain" and captured by many more market participants. Hence the need for a more thorough assessment of the value of search, which this report aims to help meet.

Box 3. The money in the search industry

The search industry comprises three main segments: enterprise search, classified and local search, and search marketing. Together they earned revenue of $40 billion worldwide in 2010.

Enterprise search

Companies that rely heavily on knowledge workers often invest in their own enterprise search capabilities to enhance the productivity and competitiveness of their staff. Others use third-party providers such as Endeca, Autonomy, Microsoft, and Exalead. In the United States, the third-party enterprise information management market was estimated to be worth $1.2 billion by 2010.[1] The global third-party enterprise search market is estimated to be worth $2.8 billion.

Classified and local search

This segment includes those that provide search capabilities for sites that classify content into particular categories, such as yellow and white page directories that have moved online, and recruiting and travel Web sites. Online searches have become by far the most common way of consulting directories, and online classified advertisements account for 80 percent of total listings.

The online classified market was worth about $2.6 billion in the United States in 2010,[2] in a global market worth approximately $8 billion. The United States accounted for 65 percent of revenue in this segment of the five countries analyzed.

Fixed-price placement of advertising in the classified database is still the largest source of revenue for participants in this segment, though it is losing ground to a model in which advertisers pay per click on their ad and/or bid for a certain key word. About 20 percent of revenue originated from the latter revenue model in the United States in 2008.[3] By 2010, the proportion had reached 40 percent.

1   Institute for Prospective Technological Studies, *Economic trends in enterprise search solutions,* European Commission Joint Research Center, http://ec.europa.eu/dgs/jrc/index.cfm?id=1410&obj_id=10930&dt_code=NWS&lang=en.

2   MAGNAGLOBAL, *US media advertising revenue forecast,* January 18, 2011; Screen Digest data on global online classifieds and directories advertising revenue by country.

3   Borrell Associates.

39 McKinsey analysis based on MAGNAGLOBAL, Global ad spend by channel, including mobile, 2000–2016, December 2010.

40 Typically, Internet search engines and classified search generate profit margins in the range of 20 to 40 percent, and SEO companies generate 10 to 20 percent profit margins (based on McKinsey analysis of returns from public companies in 2008).

Box 3. The money in the search industry (continued)

Search marketing

This segment includes search engine providers that earn advertising revenue and companies that provide search engine optimization (SEO) services. It is by far the largest segment of the three, accounting for about 70 percent of total revenue.

In most advanced Internet markets such as North America and the United Kingdom, almost 80 percent of companies market their products and services online.[4] They allocate a significant portion of their online marketing budget either to paid searches, in which they pay to have their sites appear in a prominent place on the search results page, or SEO, which helps them figure out which key words will get them higher on a search list after what is known as a "natural" key word search.

Revenue from key word search spending has been growing at 20 percent a year globally,[5] to become the largest form of online advertising spending—close to 50 percent in Europe.[6]

The market for paid searches and SEO was estimated at $15 billion in the United States and $30 billion worldwide in 2010.[7] US revenue accounted for some 80 percent of total revenue in this segment in the five countries analyzed.

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4   Econsultancy, *UK search engine marketing benchmark report,* June 2010, http://econsultancy.com/us/reports/uk-search-engine-marketing-benchmark-report.
5   *Global ad spend by channel, including mobile, 2000–2016,* MAGNAGLOBAL, December 2010.
6   Internet Advertising Board Europe, *The online ad market continues to grow despite the recession,* http://www.iabeurope.eu/news/europe%27s-online-ad-market-continues-to-grow-despite-the-recession.aspx.
7   Econsultancy in association with SEMPO, *State of search engine marketing report 2010,* 2010, http://www.sempo.org/resource/resmgr/Docs/State-of-Search-Engine-Marke.pdf.

How search unlocks value

How does an online search create value? Most research to date has looked at and quantified only three main sources of value: time saved by the searchers, money saved by consumers through greater price transparency, and the return on investment (ROI) for advertisers.

A few studies have been conducted on the first of these, time saved. One study[41] found that a successful search for academic information online took, on average, one-third of the time of a similar search in an academic library, though this did not account for the time it might take someone to travel to a library. Other studies describe how shoppers regard time saving as one of the major benefits of searching for products online.[42]

More research has examined the impact of search on product prices because of the increased transparency it enables, and several studies have researched the value derived by advertisers for paid searches—that is, paying to have their Web sites appear prominently in search results—looking at the value derived from raised awareness as well as sales.

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41   Yan Chen, Grace YoungJoo Jeon, and Yong-Mi Kim, *A day without a search engine: An experimental study of online and offline search,* working paper, School of Information, University of Michigan, 2010, http://yanchen.people.si.umich.edu/papers/VOS_20101115.pdf.
42   Andrew J. Rohm and Vanitha Swaminathan, "A typology of online shoppers based on shopping motivations," *Journal of Business Research,* July 2004, Volume 57, Number 7, pp. 748–757. See also Pradeep Chintagunta, Junhong Chu, and Javier Cebollada, *Quantifying transaction costs in online/offline grocery channel choice,* Chicago Booth School of Business research paper 09-08, 2009.

There are several additional ways in which search can create value, some of which can be measured in financial terms, and others that cannot. In all, we identified nine sources of search value that together start to reveal its true scale. Here we define each in turn and give examples that indicate the breadth of ways in which each creates value.

Nine sources of value

Better matching

Search helps customers, individuals, and organizations find information, products, and services that are relevant to their needs, and it helps those with something to offer locate the right audience or customers.

The value that search creates by pushing prices lower is considered separately.

Examples of value creation through better matching include:

- In the United States, the National Suicide Prevention Lifeline reported a 9 percent increase in legitimate calls to its hotline after links were displayed in search results pages in response to searches that included key words such as emergency, suicide, or poison.

- In a study of 1,275 consumers in four retail categories—clothing and footwear, beauty and skin care, DIY hardware, and kitchen and bathroom renovations—consumers who used the Internet to search for product information prior to making a purchase in a physical store spent more money than those who did not.[43]

Time saved

Search can make it quicker to find information, which in turn can make it quicker to make decisions and shop. As a result, it boosts productivity. The following are examples that suggest just how much time search can save:

- A typical Internet search for academic information takes seven minutes. Relying on physical references takes 22 minutes.[44]

- A consumer generally finds time to perform ten searches online but only two searches offline for each purchase.[45]

- It takes the same amount of time to do three searches in an online business directory as it does to do one in a physical directory.[46]

Analysis for this report suggests that knowledge workers in business each save 30 to 45 hours per year as a result of search.

43 Sean Sands, Carla Ferraro, and Sandra Luxton, "Does the online channel pay? A comparison of online versus offline information search on physical store spend," *The International Review of Retail, Distribution and Consumer Research,* 2010, Volume 20, Number 4, pp. 397–410.

44 Yan Chen, Grace YoungJoo Jeon, and Yong-Mi Kim, *A day without a search engine: An experimental study of online and offline search,* working paper, School of Information, University of Michigan, 2010, http://yanchen.people.si.umich.edu/papers/VOS_20101115.pdf.

45 McKinsey analysis of comScore data, eBay annual report.

46 Yan Chen, Grace YoungJoo Jeon, and Yong-Mi Kim, *A day without a search engine: An experimental study of online and offline search,* working paper, School of Information, University of Michigan, 2010, http://yanchen.people.si.umich.edu/papers/VOS_20101115.pdf.

Raised awareness

Search helps raise the profile of any brand, product, or service, and paid search is recognized as one of the most effective forms of advertising. Large amounts of advertising spend are therefore being reallocated from other media into paid search.

The benefit of paid search to advertisers tends to be inversely proportional to the size of the advertiser, as it gives the smallest of entities the ability to raise awareness of their offerings to a worldwide audience—an otherwise difficult proposition. But paid search advertising is not the only way in which search can raise awareness. Organizations and individuals benefit from natural searches—that is, when their names pop up in search results simply because of what was typed in the search field. The majority of advertisers still find that more visits to their Web sites arrive via natural searches than paid ones.[47]

Here are some additional facts and examples that illustrate the value search can create by raising awareness:

- Search is one of the most powerful influencers when a consumer is considering which brand or product to purchase. For personal computers, search is the most commonly used source of information (34 percent of times) during the active evaluation phase of the consumer purchasing decision process.[48]

- Search accounts for 25 percent of the traffic of mainstream content creators.[49]

- An analysis of some 400 small and medium-sized businesses in France showed that those that invested in paid search advertising reported around twice as many cross-border sales as a percentage of total revenue as those that did not. Over a three-year period, these businesses also reported annual growth rates that were approximately one-and-a-half times as high as those that did not invest in search advertising.[50]

- Some 70 percent of clicks following a search in the United States take users to a landing page that is less than a year old.[51] The percentage is similarly high elsewhere (India, 75 percent; France, 55 percent; Germany, 49 percent; Brazil, 40 percent).

Price transparency

This source of value is similar to better matching in that it helps users find the information they need, but here the focus is on finding products at lower prices. This report looks primarily at pricing comparison Web sites to evaluate this source of value.

More than 40 percent of Internet users in the United States, Germany, and France visited a price comparison Web site in 2010, and in the United States, their numbers are growing at around 20 percent a year.[52] Such a degree of search-enabled price transparency inevitably reduces prices in some product categories. One study showed that a 1 percent increase in traffic to a leading price comparison Web site decreased

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47 McKinsey US clickstream data, 2009.
48 McKinsey Customer Decision Journey Survey for Consumer Electronics, February 2009.
49 McKinsey US clickstream data, 2009.
50 McKinsey proprietary survey of French small and medium-sized businesses, 2010.
51 Google data as of January 1, 2011.
52 ComScore data.

price dispersion—that is, the difference between the average and minimum price for a particular good—by 1.1 percent.[53]

This source of value benefits consumers in the form of economic surplus, often at the expense of retailers and other vendors. However, price transparency may also reduce consumer uncertainty about making a purchase, reassuring consumers they are getting the best price. It could thus potentially increase total volumes sold.

Long-tail offerings

Long-tail offerings are sales of niche items that relatively few customers might want. However, the aggregate demand in the long tail—that is, across a great many niches—can account for significant sales volumes. This is certainly the case for the top online stores, which hold 6 to 23 times the number of items in their online inventories that a physical store has in order to cater to long-tail demand.[54] These inventories are so extensive that use of a search is often the only way for customers to find the items they want.

Search is commonly used for finding or selling older, long-tail media content. It enables consumers to find the book, magazine, article, film, or recording they want, and it enables content providers to monetize old content, the costs of which are already sunk.

The following examples illustrate the value search creates through long-tail offerings:

- Web sites with broad long-tail inventories, such as Amazon and eBay, get 20 percent of their traffic from natural search. In addition, niche sites whose inventories are all in the long tail get more than 25 percent of their traffic this way.[55]

- An online research firm showed that search engines were used regularly by 32 percent of US online video viewers, many of whom seek long-tail content. Word of mouth was the only "search method" used more regularly to find content.[56]

- Even when it comes to mainstream content categories such as news, people rely increasingly on search. A 2010 survey of 3,000 US adults showed that more than 40 percent of 18- to 64-year-olds used search engines to find news online more than three times a week—20 percent more than in 2008. Often, the search leads to long-tail news content.[57]

- There are also important "second order" effects. For example, search makes it profitable for Amazon to stock obscure books and for authors to write them in the first place.[58]

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53 Zhulei Tang, Michael D. Smith, and Alan Montgomery, "The impact of shopbot use on prices and price dispersion: Evidence from online book retailing," *International Journal of Industrial Organization,* November 2010, Volume 28, Number 6, pp. 579–590. For additional examples, see Erik Brynjolfsson and Michael D. Smith, "Frictionless commerce? Acomparison of Internet and conventional retailers," *Management Science,* April 2000.

54 Fenner, Trevor, Mark Levene, and George Loizou, *Predicting the long tail of book sales: Unearthing the power-law exponent,* Department of Computer Science and Information Systems, University of London, 2006, http://www.dcs.bbk.ac.uk/~mark/download/long_tail.pdf; Erik Brynjolfsson, Yu (Jeffrey) Hu, and Michael D. Smith, *The longer tail: The changing shape of Amazon's sales distribution curve,* September 20, 2010, http://ssrn.com/abstract=1679991.

55 McKinsey US clickstream data, 2009.

56 Knowledge Networks press release, "Verbal word of mouth is pivotal source for learning about, deciding to watch video—on TV or online; trumps social media as influence," November 19, 2009.

57 Pew Research Center for the People and the Press, *Ideological news sources: Who watches and why,* conducted by Princeton Survey Research Associates International, September 12, 2010.

58 Erik Brynjolfsson, Yu (Jeffrey) Hu, and Michael D. Smith, "From niches to riches: Anatomy of the long tail," *Sloan Management Review,* Summer 2006, Volume 47, Number 4, pp. 67–71.

People matching

This source of value again entails the matching of information, but this time to help online users discover each other, be it for social or employment purposes. Examples include:

- BeThe1, an online recruitment agency specializing in the luxury and fashion businesses and operating in 30 countries. The success of this French company, which has enjoyed double-digit growth since its launch in 2001, depends upon a proprietary search engine that helps it match candidates against very specific criteria.
- Shaadi.com, an Indian matchmaking site with some 11 million subscribers and estimated annual revenue of $35 million.

Exhibits 6 and 7 describe both these businesses in more detail.

Problem solving

Search tools can facilitate all sorts of problem solving, be it mundane matters such as how to put together a chair or decidedly more important ones such as whether the plant your one-year-old has just swallowed is poisonous. In business, search is commonly the starting point for solving a problem by bringing together the right teams and content.

It is hard to measure the value of problem solving. Search reduces the time and cost of looking for information while solving a problem. But because search makes so much more information accessible quickly and efficiently, it also delivers a step-change increase in capability.

A multinational company wanting, say, to assess the feasibility of producing a complex new product can use search to quickly gather together the right experts and the right data—a process that previously might have taken many weeks and still might not have identified the optimal people and information. Today, it is possible to assess an entire portfolio of products—and arguably make a better assessment—in the time it might have taken to assess just one product without search.

Despite the difficulty of measuring the impact of search, we believe the value of problem solving could outstrip that of many other sources of search value and is worthy of more, dedicated research. Adam Smith noted that specialization (and thus productivity) is limited by the extent of the market, and search increases that extent. Here are some examples that illustrate its worth:

- More than 95 percent of pharmaceutical industry companies use internal search engines to facilitate problem solving across geographies.
- Ninety-five percent of US journalists use search engines to research a story.[59]

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59 *2010 PRWeek/PR Newswire media survey,* PRWeek and PR Newswire, April 2010; 1,300 US media professionals and 1,385 US PR practitioners were surveyed online January 4–19, 2010, by C. A. Walker.

Exhibit 6

BeThe1 uses search to effectively recruit personnel in the fashion industry

CASE EXAMPLE

BeThe1 (France) is an online recruitment site whose success stems from a proprietary Web search that scouts for suitable profiles, saving time and offering better matching in the recruitment process.

Company offering
- Founded in 2001; a recruiting agency specializing in the luxury and fashion businesses
- Recruits for positions across all functions (e.g., HR, sales, marketing, retail) in 30 countries across the United States, Europe, Middle East, and Asia

Reach
- Has one of the largest databases with more than 120,000 people registered in over 140 countries
- Developed an algorithm using search engines to preselect candidate profiles matching several criteria

Results
- Has had double-digit growth since it was created and is No. 1 in France in its field with more than 30 recruitments per month
- ~5 times as productive as competitors, employs 14 employees, and has a 90% rate of success against industry average of 10–15%
- Search allows BeThe1 to reach 75% of relevant candidates for very specific jobs vs. 10% for its competitors

SOURCE: Interview with BeThe1 CEO François Bouyer; McKinsey analysis

Exhibit 7

Shaadi.com uses search to provide matrimonial matches

CASE EXAMPLE

Shaadi.com relies on search to provide value to customers by increasing the pool of marital candidates they can choose from.

Company offering
- Founded in 1996; a popular Indian matrimonial site
- Objective: "to provide a superior matchmaking experience by expanding the opportunities available to meet potential life partners"
- Uses search to help match millions of users to each other for matrimonial purposes

Reach
Million

- December 2009
- December 2010

Page views: 8.4 / 6.1

Unique visitors: 2.4 / 1.7

Over 11 million subscribers, mobile and nonmobile

Financials
Estimated revenue
USD Millions

2007: 0
2009: 0
2011: 35

60% ad-based,
40% subscription-based

SOURCE: Company Web site; EmPower Research; press search; McKinsey analysis

New business models

Without search, many recently developed companies and business models would not exist. Price comparison sites are a case in point. Examples of new companies and business models that are thriving on the back of search technology include:

- Kayak.com, a US online travel site that aggregates results from hundreds of travel sites to help users find the cheapest flights available. In December 2010, it had 4.3 million unique US visitors and 47 million page views.

- Justdial, referenced earlier in this report, is a search service in India for those without Internet access or who perhaps cannot read. Callers, regardless of their language, can ask an operator to search on their behalf. The business model is a variation of paid search. When a caller accesses a sponsored search result, the advertiser pays Justdial a fee, much like the cost-per-click model in advertising. Its 2009–10 revenue was 1.34 billion rupees ($29 million)—an average of 7 rupees ($0.15) per customer.

Exhibits 8 and 9 describe these businesses in more detail.

Entertainment

Given the quantity of digital music and video available, entertainment is a rich driver of search value. For a generation of teenagers who prefer to watch videos on YouTube rather than television, search has enabled a new form of entertainment. Its entertainment value will only increase as the Internet becomes the primary digital infrastructure for video programming of all kinds, effectively turning our televisions into network devices.

The essential role search plays in entertainment is illustrated by the following statistics:

- 30 percent[60] of total queries on Web search engines are for such topics as entertainment, adult content, games, or sports.

- 21 percent of YouTube streaming video traffic arrives via search.[61]

- There were 40 billion searches in 2009 on YouTube's site in the United States, representing around 20 percent of all US searches for YouTube content.[62] The other 80 percent came from other search engines.

- 20 percent of MTV's streaming media (e.g., video) traffic arrives via search.[63]

- 7 percent of Vevo's streaming music traffic comes via search. Vevo is the leading subscription music service in the world.[64]

We do not claim that this list of the sources of search value is exhaustive, but it does capture a wide variety of ways in which search can affect various constituencies. As search evolves and the superset of searchable content continues to expand, we anticipate that new and unexpected sources of value will emerge. In the next section, we examine in more detail how these nine sources of search value affect different constituencies.

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60 ComScore data.
61 ComScore data.
62 McKinsey analysis based on ComScore data.
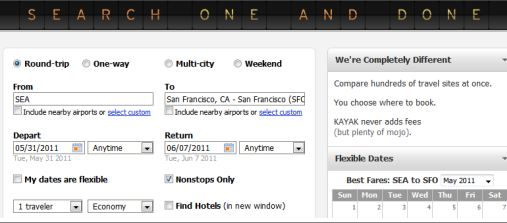63 ComScore data.
64 ComScore data.

Exhibit 8

Kayak.com uses search to help consumers match tickets at the lowest fare levels

CASE EXAMPLE

Kayak.com has successfully used search to aggregate results for ticket prices, building a strong business that makes booking tickets easy and price transparent.

Company offering
- Founded in 2004; an online travel search engine that aggregates results from hundreds of travel sites worldwide
- Consumers can see thousands of results and sort by price, allowing them to find the cheapest tickets available
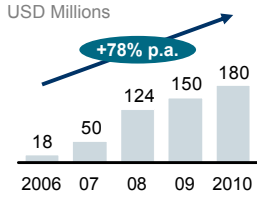
Reach in United States
Million

- December 2008
- December 2009
- December 2010

Page views
39
49
47
+9% p.a.

Unique visitors
3.6
4.0
4.3
+8% p.a.

Business model
Estimated revenue
USD Millions

+78% p.a.

18
50
124
150
180

2006 07 08 09 2010

PPC ads and referrals for ticket purchase

SOURCE: Compete; kayak.com; Internet research; NeXt Up!; press search; McKinsey analysis

Exhibit 9

JustDial provides voice-enabled local search in India

CASE EXAMPLE

Just Dial provides innovative local search by leveraging phone operators to overcome access and literacy problems.

Company offering
- Indian local search destination started in 1996
- Customers dial a phone number and a live representative provides search results
- Search also available through SMS and Web

Reach
- Over 25 million unique users
- Over 200 million searches in a year
- Covers more than 200 cities in India

Financials
Search referrals and ad-based model

32

0   0

72 million calls

2005 2007 2009

SOURCE: justdial.com; press search; McKinsey analysis

The value of search: Who benefits and how?

Search affects the activities of millions of people and organizations, so we cast our research net wide when trying to assess its value. We looked at its impact on businesses, individuals, and public service entities, homing in on 11 constituencies within these main groups—for example, advertisers and retailers in business, and health care and education in public services. We then examined the relevance of the nine sources of value to each in monetary and nonmonetary terms.

The results should be regarded as case studies illustrating the value of search rather than as a fully exhaustive analysis. If the task of quantification was too uncertain for some sources of value—such as calculating the value of better matching for retailers— or if the value was likely to be minor, it was not included in our analysis.

An analysis of value by constituency

The study showed that value accrues to all constituencies. The three most-studied sources of value from search—time saved, raised awareness, and price transparency— are important. Our study illustrated the additional impact of the other six sources of value we identified and revealed the extent to which the value of search goes underestimated. Exhibit 10 shows the sources of value for each constituency.

Exhibit 10

Primary sources of value from search

Constituencies	Better matching	Time saved	Raised awareness	Price transparency	Long-tail offerings	People matching	Problem solving	New business models	Entertainment
Advertisers	■		■						
Retailers	■		■	■				■	
Entrepreneurs	■	■	■			■	■		
Content creators	■		■	■			■		
Enterprise	■					■	■		
Consumers	■			■	■				
Individual content creators					■	■			■
Individual information seekers	■					■	■		■
Health care	■		■	■					
Education	■		■			■			
Government	■	■	■						

SOURCE: McKinsey analysis

The following section describes in more detail how value accrues to each of the constituencies. Where possible, we quantify a particular source of value. When that is not possible, we illustrate its impact qualitatively.
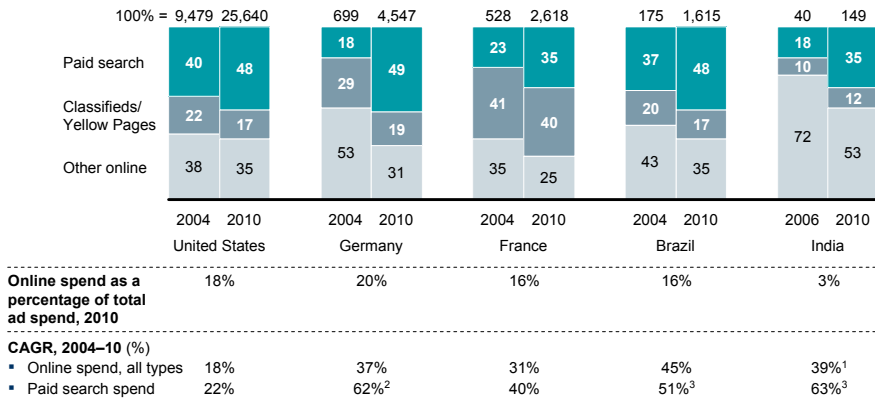
Advertisers

Having grown rapidly in the past five years, online advertising now accounts for a significant portion of total advertising spend, namely 18 percent in the United States, 20 percent in Germany, 16 percent in France, 16 percent in Brazil, and 3 percent in

India[65] (Exhibit 11). Of that online spend, advertisers allocated around 40 percent to search advertising, thus spending about 6 percent of their total advertising outlay on online search advertising globally.[66]

Exhibit 11

Online advertising spend across countries by type, 2004–10
%; USD millions

	United States		Germany		France		Brazil		India	
100% =	9,479	25,640	699	4,547	528	2,618	175	1,615	40	149
Paid search	40	48	18	49	23	35	37	48	18	35
			29						10	12
Classifieds/ Yellow Pages	22	17		19	41	40	20	17	72	
			53							53
Other online	38	35		31	35	25	43	35		
	2004	2010	2004	2010	2004	2010	2004	2010	2006	2010

	United States	Germany	France	Brazil	India
Online spend as a percentage of total ad spend, 2010	18%	20%	16%	16%	3%
CAGR, 2004–10 (%)					
▪ Online spend, all types	18%	37%	31%	45%	39%[1]
▪ Paid search spend	22%	62%[2]	40%	51%[3]	63%[3]

1 2004 data for search in India were not available, so 2006 was used.
2 Germany 2004 paid search data not available, so Magna Global number was used; classifieds were calculated by using Source Digest nondisplay, MAGNAGLOBAL paid search.
3 US ratio of classifieds ÷ (paid search + classifieds) was used to split paid search from MAGNAGLOBAL into paid search and classifieds for India and Brazil.

SOURCE: Source Digest; MAGNAGLOBAL; McKinsey analysis

What are the sources of value that motivate advertisers to spend so much on search? First, search and search advertising raise awareness. Search is an influential channel when consumers are deciding whether to make a purchase and what to buy. For example, McKinsey research shows that search engines dominate the touch points in the awareness and consideration phases of the purchasing process, particularly for automobiles, consumer electronics, and travel.[67] Other research, this time in the personal computer industry, shows that when customers are evaluating products, Web searches are the most influential touch point, even higher than in-store touch points such as meeting with a sales representative.[68]

Second, search has proven to be an extremely effective means of matching relevant information with user needs, helping advertisers target the right audience. Someone who searches for "auto insurance," for example, is likely to be interested in purchasing insurance, and an appropriate advertisement in the search results is likely to attract interest.

Third, search helps consumers find long-tail, niche products that they would otherwise be unlikely to discover.

All of these sources of value are particularly important to smaller companies, which, at relatively low cost, can reach a big audience. This is reflected in the fact that many more companies use search advertising than they do offline advertising formats. In the

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65 MAGNAGLOBAL, Global Forecast Model, 2010.
66 MAGNAGLOBAL, Global Forecast Model, 2010.
67 McKinsey Digital Marketing Survey, 2007.
68 McKinsey Customer Decision Journey Survey for Consumer Electronics, February 2009.

United States, paid search is used by about ten times as many advertisers as any other media channel (online display is second).[69]

We quantified the value of search to advertisers[70] from the three sources already described by estimating the ROI they earn from paid search advertising (both online and mobile), SEO, and online classified advertising. By looking at the effectiveness of search advertising, we estimated advertisers earn an average ROI of 7:1, given the typical mix of types of search-related advertising (see methodology for details). Based on these calculations, we estimated that the value advertisers derived from search in 2010 was $121 billion in the United States, $13 billion in Germany, $10 billion in France, $5 billion in Brazil, and $1 billion in India.
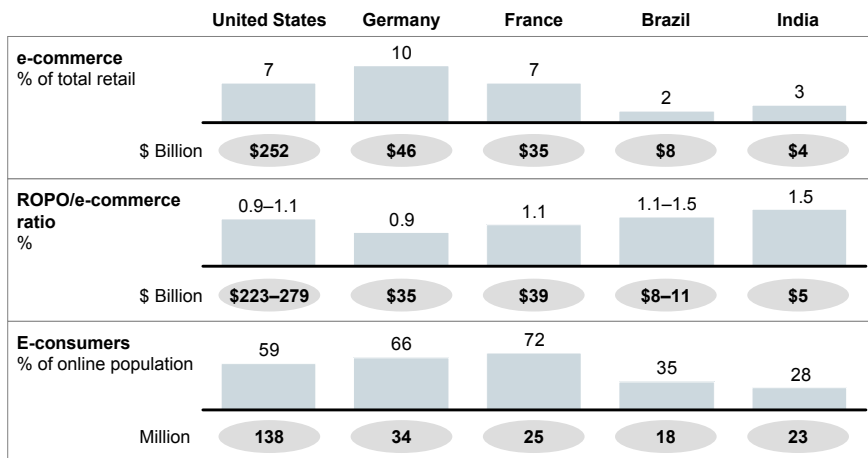
Retailers

Search benefits retailers through raised consumer awareness of their online and offline stores and products; better matching of products to customer needs; and the ability to better sell long-tail items. In the process, new retail business models have emerged, such as online retailers dedicated to sales of long-tail items, and smaller retailers have discovered a more level playing field: as the size of the retailer decreases, the relative benefit gained from search increases. For retailers that compete on the basis of price, price transparency is also a source of value. For others, however, it can result in surplus accruing to consumers.

E-commerce has experienced double-digit growth over the past three years, and search has played a critical role in that growth. E-commerce was worth $252 billion in the United States in 2009, representing 7 percent of total retail spending there. In Germany, e-commerce totaled $46 billion (10 percent of retail spending); France, $35 billion (7 percent); Brazil, $8 billion (2 percent); and India, $4 billion (3 percent). In the five countries studied, anywhere between 30 and 70 percent of the population shopped online (Exhibit 12).

Exhibit 12

E-commerce, ROPO[1] ratio, and e-consumers across countries, 2009

	United States	Germany	France	Brazil	India
e-commerce % of total retail	7	10	7	2	3
$ Billion	$252	$46	$35	$8	$4
ROPO/e-commerce ratio %	0.9–1.1	0.9	1.1	1.1–1.5	1.5
$ Billion	$223–279	$35	$39	$8–11	$5
E-consumers % of online population	59	66	72	35	28
Million	138	34	25	18	23

1 ROPO = Research Online–Purchase Offline.
SOURCE: Forrester; Fevad; BVH; PhoCusWright; Euromonitor; ComScore; survey performed by TNS Sofres/Consumer barometer in France, Germany, and India; ACTA consumer survey; e-Marketer; e-bit WebShoppers; McKinsey Global Institute

69 TNS; Media Dynamics, 2008.
70 When calculating the value, we defined advertisers as organizations that use paid search advertising as well as those that benefit from natural search.

Search plays a bigger role in enabling retail sales than the e-commerce figures alone suggest. That is because search enables what is known as Research Online-Purchase Offline (ROPO): consumers collect information on the Web that informs their purchasing decision, and then they go to a physical store to buy what they have chosen. The estimated ratio of ROPO purchases to online purchases in the countries studied ranged between 0.9 and 1.5. In other words, the value of goods researched online and purchased offline is similar to that of goods researched and purchased online.

We estimated the value of search to retailers[71] by looking at the volumes of sales that occur because search was used at some stage in the decision-making process. This volume was calculated by synthesizing the results of three separate analyses. (See methodology for details.)

Accordingly, the value of search for retailers was worth 2 percent of total retail volumes in the developed economies studied in 2009 and 1 percent in the developing ones where e-commerce is less prevalent. This represents 10 to 15 percent of the value of e-commerce and ROPO sales combined and translates into search value for retailers ranging from $1 billion in India to well over $50 billion in the United States (Exhibit 13).

Exhibit 13

Impact of search on e-commerce and ROPO, 2009
USD billions

	United States	Germany	France	Brazil	India
E-commerce	31–32	5.0–5.3	3.3–3.5	1.0	0.4
ROPO	26–35	3.9–4.0	3.8–3.9	1.1–1.4	0.7
Total	57–67	8.9–9.3	7.1–7.4	2.1–2.4	1.1
% of retail	1.8%	1.9%	1.4%	0.7%	0.7%

SOURCE: Hal Varian, "Online ad auctions," May 2009; McKinsey primary research, Digital Marketing Survey, 2007; comScore; Nielsen; McKinsey analysis

It should be noted that these figures represent net value. They do not include costs or the impact of price transparency on retail revenue.

Entrepreneurs

Entrepreneurs are heavy users of search tools and benefit from them in various ways throughout the start-up life cycle. It helps them problem solve when testing new business ideas; find suppliers, investors, and customers; and identify key talent—the latter an important challenge for small companies whose every employee can be crucial to success. A Canadian survey found that 96 percent of entrepreneurs used search for general research and that 77 percent used it for competitive intelligence.[72] A separate

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71 We define retailers for the purpose of this calculation as businesses with a presence on the Web that sell products and/or services to consumers either online or offline.

72 Business Development Bank of Canada, *ViewPoints online panel: Ad hoc study among Canadian entrepreneurs,* September 2009.

Israeli survey of entrepreneurs found that search engines were the most heavily used tools for information retrieval.[73]

Perhaps most important, search has fostered new, entrepreneurial business models. So-called micro-multinationals are born global as search gives them instant access to a worldwide audience of potential customers. Niche-market players also depend upon search to find the suppliers and customers they need. Shoes of Prey is an Australian shoe manufacturer whose customers are invited to design their own shoes. Without search, this company would have found it difficult to find a critical mass of such customers. But a paid search campaign that gave it access to an international market means that some 40 percent of its sales are now to overseas customers.

Some companies have been born on the back of a particular source of search value. India's Shaadi.com and France's BeThe1 recruitment site are the product of people matching. Others use long-tail business models. QueBarato, for example, is a Brazilian classifieds Web site operating in Latin America and the United States. It has more than 4.8 million listings a day generated by individuals and small business for jobs and events and for real estate, vehicles, and many other products.

Given the many ways in which search creates value for entrepreneurs, it is difficult to quantify and we have not attempted to do so. However, the previous examples illustrate the scope of the benefits.

Content creators

Content creators derive value from search in a variety of ways. Many profit from their retail activities, so some of the sources of value that apply to retailers apply to these businesses, too. With so much online content available, search enables better matching of consumer demand to content supply; it raises awareness of mainstream content creators and directs traffic to them; and it makes more obscure, long-tail content discoverable. As advertisers, content creators also benefit from the sources of value that other advertisers enjoy: raised awareness, better matching, access to the long tail, and new business models.

We quantified two sources of search value for content creators: revenue from search-related advertising (on horizontal Web search engines and internal searches within Web sites) and revenue from content sales[74]—that is, sales of books, music, and videos through e-commerce and as a result of ROPO. (See the methodology for more detail.)

Exhibits 14 and 15 show the value accrued by content creators from each of these revenue streams. In the United States, the value from advertising is well over $2.2 billion; in India, it's more than $20 million. The value from content sales is more than $300 million in the United States, representing up to 1 percent of US content sales. In India, the value from content sales is $25 million, representing 4 percent of Indian content sales.

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73 Snunith Shoham, Shifra Baruchson-Arbib, and Osnat Gouri-Oren, "An exploratory study of Israeli start-up entrepreneur usage of the Internet," *Journal of Information Science,* Volume 32, Number 1, February 2006, p. 49.

74 We did not attempt to quantify the value of business-to-business content creators or media companies that sell on a subscription basis, although we acknowledge this is a source of significant value.

Exhibit 14

Search value to content creators, 2010

USD millions

	United States	Germany	France	Brazil	India
Total nonsearch online ad market (i.e., online display and rich media)[1]	8,978	1,428	657	568	79
Advertising revenue from horizontal Web search engines (~20–25% of total)	1,796–2,244	286–357	131–164	114–142	16–20
Advertising revenue from internal search within Web sites (~5–7% of total)	449-628	71–100	33–46	28–40	4–6
Total	**2,244–2,873**	**357–457**	**164–210**	**142–182**	**20–25**

1 US data are gross spend. All other countries are net spend. Net spend excludes amount given to ad agencies.
SOURCE: McKinsey analysis

Exhibit 15

Search value to content creators as retailers, 2009

USD millions

	United States	Germany	France	Brazil	India
E-commerce[1]	291–407	80–107	52–79	15–20	7–9
ROPO[2]	58–204	16–22	26–35	42–55	20–26
Total	**349–611**	**96–129**	**78–105**	**56–75**	**27–36**
% of total retail value	0.7–1.0%	1.1–1.4%	1.2–1.6%	2.7–3.0%	3.3–4.0%

1 Portion of e-commerce for the product subcategory of books and music and video by country. It is assumed that around 30 percent of that figure reverts to content creators, with the remainder captured by distributors.
2 ROPO coefficient for books and music and video by country. It is assumed that around 30 percent of that figure reverts to content creators, with the remainder captured by distributors
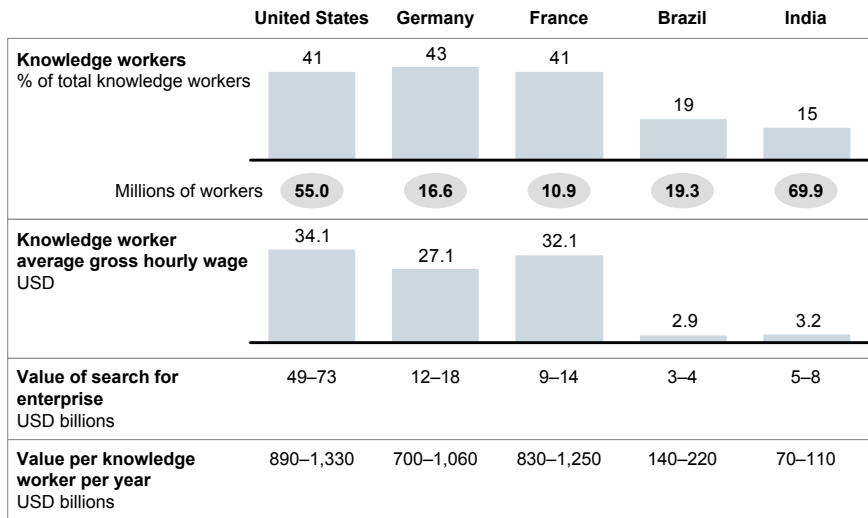SOURCE: McKinsey analysis

Enterprises

Enterprises benefit from search in a multitude of ways, including the ability to find the right information, supplier, or employee through better matching; employee time saved by searching online; and collaborative problem solving. As a gauge of some aspects of search value to enterprise, we calculated the value of the productivity gains made by knowledge workers that many of the sources of value deliver.

Several existing studies[75] have demonstrated significant productivity gains from search in different geographies. We assume a 10 to 15 percent gain in productivity for the time that enterprise knowledge workers spend searching for information. The value of this productivity gain was calculated on the assumption that knowledge workers spend on average five hours per week, or about 12 percent of their time, searching online. We then took into account local wages and the number of knowledge workers per country to arrive at an estimate of the value of search in 2009 in the five countries studied. Exhibit 16 shows how value ranges from $49 billion to $73 billion in the United States to $3 billion to $4 billion in Brazil.

Exhibit 16

Quantifying the impact of search on enterprises across countries, 2009

	United States	Germany	France	Brazil	India
Knowledge workers % of total knowledge workers	41	43	41	19	15
Millions of workers	55.0	16.6	10.9	19.3	69.9
Knowledge worker average gross hourly wage USD	34.1	27.1	32.1	2.9	3.2
Value of search for enterprise USD billions	49–73	12–18	9–14	3–4	5–8
Value per knowledge worker per year USD billions	890–1,330	700–1,060	830–1,250	140–220	70–110

SOURCE: McKinsey analysis

The percentage of knowledge workers in different geographies currently varies from 15 percent in India to more than 40 percent in the United States, France, and Germany.[76] However, in all geographies, the number of knowledge workers in the economy is growing, as is the proportion of knowledge workers. The enterprise value of search as measured by productivity gains among these workers will therefore increase over time.

Consumers

This constituency consists of individuals who use search for transactional purposes, regardless of whether the purchase is eventually made online or off.

Consumers primarily benefit from search through increased price transparency, better matching—including access to long-tail products and finding people—and time saved. When it comes to price transparency, academic research shows that the more visits made to price comparison Web sites, the lower prices fall and the greater the

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75   Yan Chen, Grace YoungJoo Jeon, and Yong-Mi Kim, *A day without a search engine: An experimental study of online and offline search,* working paper, School of Information, University of Michigan, 2010, http://yanchen.people.si.umich.edu/papers/VOS_20101115.pdf; *The hidden costs of information work,* IDC white paper, March 2005; McKinsey proprietary survey of French small and medium-sized businesses, 2010.

76   *The hidden costs of information work,* IDC white paper, March 2005, corroborated by McKinsey primary research.

difference between the average and minimum price for a particular good.[77] Thus, price transparency has a disciplining effect on the margins retailers can expect, which benefits consumers. Preliminary research shows prices online are, on average, 10 percent lower than those offline as a result of the price transparency afforded by search tools.[78]

Better matching is particularly valuable to consumers when they want long-tail items. Research shows that consumers value a hard-to-find, long-tail product anywhere between 1.3 to 1.8 times the actual price of the product.[79] Consumers therefore capture significant amounts of surplus when they buy products in the long tail.

With regard to time saved, various studies taken together suggest that consumers who search online for their purchase can save 10 to 20 hours a year.[80] Using data from academic studies, we valued that time at between $0.5 and $7 per hour, based on average, after-tax income per household in each country and the assumption that a consumer's leisure time was worth 65 percent of this figure.[81,82]

In addition, there are other aspects of consumer value, such as better matching that is not in the long tail, or the convenience of online shopping. Taking all this into account, we calculated that the value created for consumers in 2009 ranged from $41.9 billion in the United States to $0.5 billion in India (Exhibit 17). The methodology explains these calculations in more detail.

The value to consumers is likely to rise as people increasingly use smartphones to research products while shopping in physical stores. Consumers are also likely to benefit from new, location-based search services that take into account not only the search terms but also the user's location, providing even better matching of product and service offers to customer needs.

Individual content creators

One of the most interesting aspects of the Internet revolution has been the emergence of hundreds of millions of individual online users who create and share content—blogs, reviews, photos, videos, and social networking information—without expecting to make any money from it. These are the people who fall into this constituency. "Social media" is the term commonly used to capture their online activity, but it can also be seen as a means of self-expression, and one that would be much less effective without search technology.

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77   Zhulei Tang, Michael D. Smith, and Alan Montgomery, "The impact of shopbot use on prices and price dispersion: Evidence from online book retailing," *International Journal of Industrial Organization,* Volume 28, Number 6, November 2010, pp. 579–590.

78   Primary McKinsey research in France, India, and the United States.

79   Erik Brynjolfsson, Michael D. Smith, and Yu (Jeffrey) Hu, "Consumer surplus in the digital economy: Estimating the value of increased product variety at online booksellers," *Management Science,* 2003, Volume 49, Number 1, pp. 1580–1596.

80   Low end is based on IDC estimate of efficiency gains for enterprise searches in *The hidden costs of information work,* IDC white paper, March 2005. High end is based on efficiency gains for general online searches in Yan Chen, Grace YoungJoo Jeon, and Yong-Mi Kim, *A day without a search engine: An experimental study of online and offline search,* working paper, School of Information, University of Michigan, 2010, http://yanchen.people.si.umich.edu/papers/VOS_20101115.pdf.

81   Austan Goolsbee and Peter J. Klenow, *Valuing consumer products by the time spent using them: An application to the Internet,* paper prepared for the American Economic Association session on "The roots of innovation," Boston, MA, January 8, 2006.

82   Sergio Jara-Díaz, Marcela Munizaga, Paulina Greeven, Reinaldo Guerra, and Kay Axhausen, "Estimating the value of leisure from a time allocation model," *Transportation Research Part B: Methodological,* December 2008, Volume 42, Number 10, pp. 946–957.

Huge numbers of people generate their own content. Depending on the geography, individual content creators represent anywhere from 30 to 60 percent of all Internet users, with the percentage higher in developing economies. Between 40 and 60 percent of Internet users regularly browse user-generated content[83] (Exhibit 18).

Exhibit 17

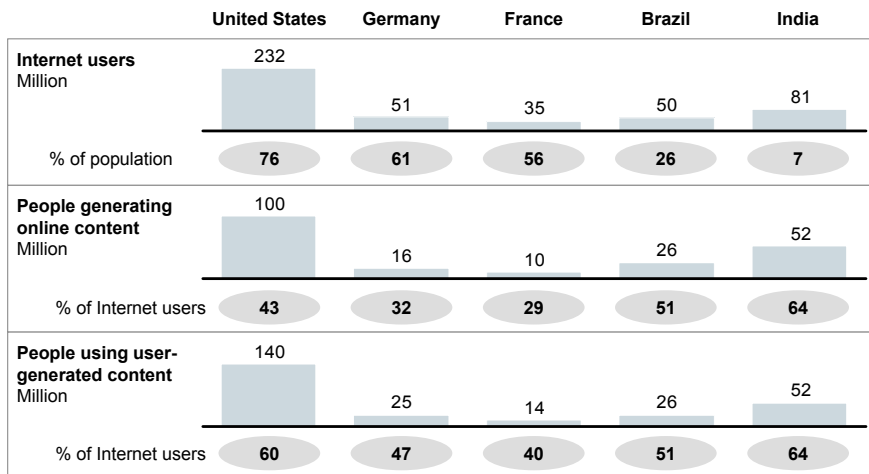### Impact of search on consumer surplus, 2009
USD billions

	United States	Germany	France	Brazil	India
Consumer surplus	21.2	3.2	2.5	0.7	0.4
▪ Better prices	3.1	0.5	0.3	0.1	0.0
▪ Long-tail access	13.0	1.9	1.5	0.5	0.2
▪ Other	5.1	0.8	0.7	0.2	0.2
Time saved	20.7	4.8	4.1	0.4	0.1
Total	**41.9**	**8.0**	**6.6**	**1.1**	**0.5**
USD per Internet user	15	13	16	2	0
USD per e-consumer	25	20	22	5	2

NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey analysis

Exhibit 18

Summary of individual content creators across countries, 2009

	United States	Germany	France	Brazil	India
Internet users Million	232	51	35	50	81
% of population	76	61	56	26	7
People generating online content Million	100	16	10	26	52
% of Internet users	43	32	29	51	64
People using user-generated content Million	140	25	14	26	52
% of Internet users	60	47	40	51	64

SOURCE: McKinsey analysis

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83 eMarketer.

This explosion of user-generated content is concentrated in three types of Web sites:

- Aggregators of user-generated videos (YouTube), photographic images (Flickr), consumer reviews (Yelp), and other collaborative information resources such as Wikipedia.

- Social networks such as Facebook, LinkedIn, and Myspace.

- Individual blogs, diaries, and micro-blogging services such as Twitter.

Search makes all of this personal content accessible, delivering value through better matching, people matching, and long-tail offerings. Many social media sites have internal search capabilities for finding other people, a direct application of people matching, for example. And much user-generated content is long-tailed to the extreme.

It is hard to measure the value of search to individual content creators. However, the sheer numbers of those who create content to express themselves in one way or another—knowing that search will help make their voices heard—explain in part the power of social mediia to influence social dynamics around the globe.

Individual information seekers

This group includes individuals who use the Internet to find information of any kind, including entertainment, for their own purpose—which means just about everyone who uses the Internet. We distinguish individuals in this role from their role as consumers, as their objective is not to purchase or acquire merchandise but usually to answer a question or to learn or experience something.

Most value for this constituency lies in the efficient discovery of the "right" information, a form of matching, be it the right job or the right professional in the yellow pages. Much of this information can also be regarded as a long-tail offering, as individual information seekers are often after a niche product—perhaps a specific date to include in an essay, a digital map showing the easiest driving route to a friend's home, an old newspaper story from the archive, or yesterday's sports scores. Search can give individuals access to the most detailed, esoteric information on demand, and from just about anywhere.

Mobile digital devices increase the opportunity to seek information. Mobile search patterns are only now beginning to emerge, but it is clear that users find search-on-the-go particularly useful. Recent research shows that 28 percent[84] of smartphone users use search to get maps and directions and that 48 percent[85] of searches on mobile phones are related to local activities. A good indicator of just how fast users are embracing mobile search is the fact that mobile usage of Google Maps, which is available on 13 percent of all mobile phones, grew by 58 percent last year.[86]

To gauge the value of search to this constituency, we used conjoint analysis to ascertain what value Internet users placed on certain services such as Web search, access to directories, and social networks. We then estimated the extent to which search enabled these services by looking at the number of searches made relative to the number of pages viewed per service, and we adjusted the value accordingly. (See methodology for further detail.) Exhibit 19 shows how the value of search to information seekers in France—€4.6 ($6.50) per month—was calculated.

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84   Opus Research.

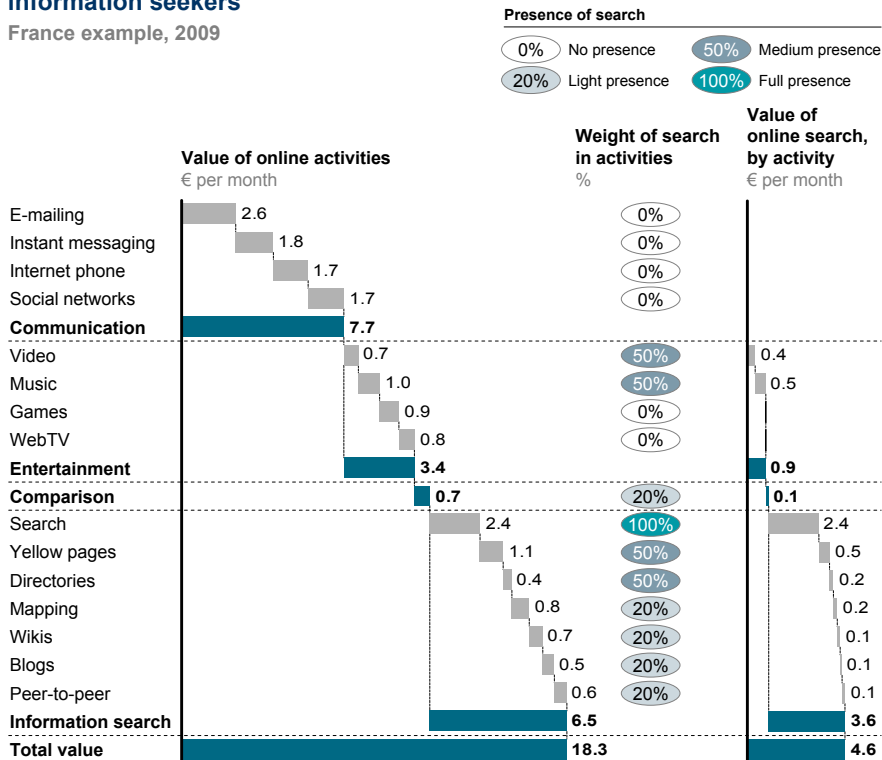85   McKinsey iConsumer survey in the United States, 2010.

86   ComScore, press searches.

Exhibit 20 shows our estimates of the value created by search for individual information seekers in each of the countries studied. We estimate this to be between around $70 and $110[87] per year per Internet user in France, Germany, and the United States, and around $150 to $160[88] in Brazil and India. Of this, around 55 percent[89] of the value comes from horizontal Web search engines (e.g., text queries, Web mapping queries); 25 percent from internal Web site searches (directories, yellow pages, Wikis); and 20 percent from entertainment searches (games, music, video, WebTV, and peer to peer).

Exhibit 19

Methodology to define value of search for information seekers

France example, 2009

Presence of search

| 0% | No presence | 50% | Medium presence |
| 20% | Light presence | 100% | Full presence |

	Value of online activities € per month	Weight of search in activities %	Value of online search, by activity € per month
E-mailing	2.6	0%	
Instant messaging	1.8	0%	
Internet phone	1.7	0%	
Social networks	1.7	0%	
Communication	**7.7**		
Video	0.7	50%	0.4
Music	1.0	50%	0.5
Games	0.9	0%	
WebTV	0.8	0%	
Entertainment	**3.4**		**0.9**
Comparison	**0.7**	20%	**0.1**
Search	2.4	100%	2.4
Yellow pages	1.1	50%	0.5
Directories	0.4	50%	0.2
Mapping	0.8	20%	0.2
Wikis	0.7	20%	0.1
Blogs	0.5	20%	0.1
Peer-to-peer	0.6	20%	0.1
Information search	**6.5**		**3.6**
Total value	**18.3**		**4.6**

NOTE: Numbers may not sum due to rounding.
SOURCE: IAB study; McKinsey analysis

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87 McKinsey & Company for IAB Europe, *Consumers driving the digital uptake: The economic value of online advertising-based services for consumers,* September 2010.

88 McKinsey & Company for IAB Europe, *Consumers driving the digital uptake: The economic value of online advertising-based services for consumers,* September 2010; Brazil and India estimates based on Russian data.

89 Based on a McKinsey analysis of weight of search for each Internet activity based on comScore data.

Exhibit 20

Value of search

USD per user per month

Impact of search on . . .	United States	Germany	France	Brazil	India
Value of horizontal Web search	4.9	3.2	3.3	8.8	8.8
Value of internal Web site search	2.1	1.4	1.8	2.5	2.5
Value of entertainment	2.3	1.2	1.2	2.4	1.2
Total per Internet user per month	9.3	5.8	6.3	13.7	12.5
Total per Internet user per year	112	70	76	164	150
Total per year for all users USD billions	22.9	3.5	2.6	8.2	12.1

SOURCE: McKinsey analysis

Health care

Health care represents a large share of GDP in the five countries studied in this report: 10 to 16 percent in the United States; 8 to 11 percent in France and Germany; and 5 to 8 percent in India and Brazil.[90] Health care expenditure is also growing faster than GDP growth in most countries, making the potential value for search particularly important for this constituency.

For patients, search delivers value by raising awareness about health-related topics or helping them find useful information. Search also enables people matching—perhaps finding the right doctor or support community. In the United States[91] and Brazil,[92] some 80 percent of the population searched online for a health-related topic in 2010, each performing an average of 60 to 65 health-related queries per year. And in the United States, search drove 30 to 40 percent of the total traffic at the top five health-related Web sites (Exhibit 21).

For health care providers, better matching and access to long-tail content can help reduce costs, by enabling patients to search for relevant, routine healthcare information on the Web rather than always requiring the involvement of a medical professional. But for health care providers, payers, and patients alike, the best source of search value might prove to be improved health outcomes. Though this has yet to be measured, there is already some evidence that search changes the behavior of health care providers. For example, 86 percent of US physicians search online for medical information, and one-third of their searches change the way they treat patients.[93]

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90 Data taken from Global Health Observatory and World Health Organization National Health Accounts.
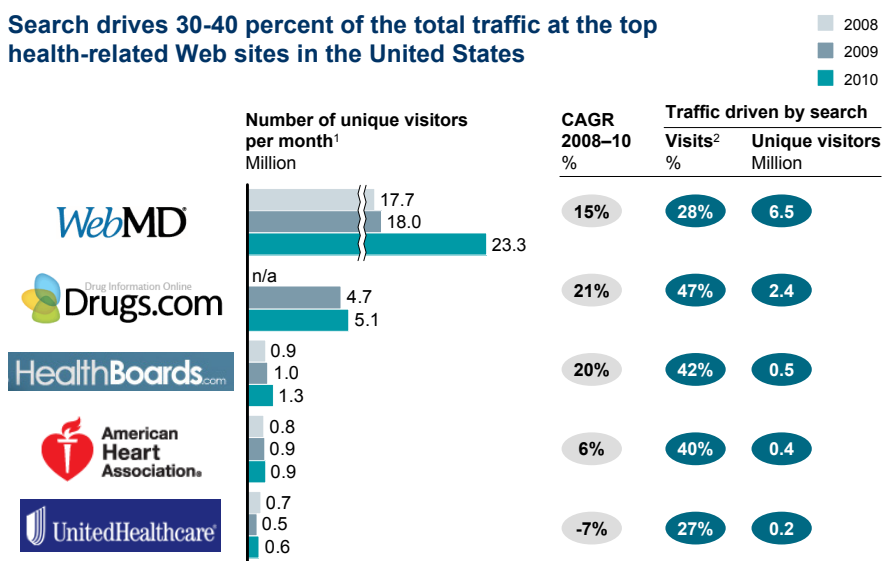91 Pew Internet and American Life Project, 2010.
92 Survey of 603 Internet users conducted by Google and Media Screen in Brazil in July 2008.
93 Survey conducted of 411 physicians (primary care physicians/general practitioners, cardiologists, and psychiatrists) by Google and Hell & Partners.

Exhibit 21

Search drives 30-40 percent of the total traffic at the top health-related Web sites in the United States

2008
2009
2010

	Number of unique visitors per month[1] Million	CAGR 2008–10 %	Traffic driven by search	
			Visits[2] %	Unique visitors Million
WebMD	17.7 / 18.0 / 23.3	15%	28%	6.5
Drugs.com (Drug Information Online)	n/a / 4.7 / 5.1	21%	47%	2.4
HealthBoards.com	0.9 / 1.0 / 1.3	20%	42%	0.5
American Heart Association	0.8 / 0.9 / 0.9	6%	40%	0.4
UnitedHealthcare	0.7 / 0.5 / 0.6	-7%	27%	0.2

1 August 2010.
2 Conservative estimate of unique visitors assuming that the number of visitors coming through search engines are more likely to be unique visitors than the visitors coming directly to the Web site.

SOURCE: ComScore; McKinsey analysis

Other examples of the potential value of search in health care include:

- Google's flu index analyzes queries for terms that would indicate a rise in symptoms associated with flu, a potentially powerful tool for epidemiologists and one that could help public health officials and health professionals better respond to epidemics.

- AOK, a Germany health insurer, uses an internal search engine to compare and monitor hospitals' key performance indicators.[94]

- Sunnybrook, a US health science center, uses an internal search engine to help its 10,000 physicians access more than 250,000 documents and provide more informed patient care.

Education

As with health care, the best measure of the value of search in education might be its impact on outcomes, but any attempt to measure this is beyond the scope of this research. Instead, we offer examples that demonstrate the ubiquity of search in education for students and teachers alike.

Almost 4 percent of all searches in the United States are for educational courses, curricula, and tutorials. That amounted to 6 billion searches in 2010, with average annual growth of 12 percent from 2008 to 2010.[95] In another survey, some 42 percent of Indians who used the Internet cited education and learning as one of the top three reasons to use the Internet.[96]

Search also helps those not enrolled at educational institutions. The nonprofit Khan Academy offers a free set of educational videos. In 2010, one million students a day

94   AOK Web site and German public data.
95   ComScore Search Benchmarker.
96   iConsumer India, 2010.

visited the Khan Academy site and watched between 100,000 and 200,000 videos a day. Eleven percent of the Khan Academy's page views came from search.[97]

Search supports initiatives to help keep education affordable and accessible to all. For example, Project Gutenberg has more than 19,000 classics and textbooks online for free. About 23 percent of its traffic comes through search. Flatworldknowledge.com also offers free online textbooks and gets 16.7 percent of its traffic through search, well over two-thirds of which is from countries other than the United States.[98]

A survey of biology teachers in New York state found that 99 percent used search engines as a tool for instructional planning, 89 percent used specific Web sites, and only 20 percent used digital libraries.[99]

Government

Governments around the world have come to depend upon search to provide their services. In 2010, 3.8 percent of all searches in the United States—5.2 billion in all— were government-related, and the number grew at a compound annual growth rate of 11 percent between 2008 and 2010.[100] In December 2009, 44 percent of visits to US government Web sites were facilitated by search engines.[101] In Germany, the share was even higher—between 49 and 75 percent.

People and organizations visit government sites for all manner of reasons, as Exhibit 22 illustrates, and search has become a key element of e-government, helping governments to engage with citizens, improve public service delivery, enhance transparency, and strengthen public participation and democratic processes.

Exhibit 22

Leading activities conducted on government Web sites according to US Internet users, December 2009

% of respondents

Looked for information about a public policy or issue online with their local, state, or federal government	48
Looked up what services a government agency provides	46
Downloaded government forms	41
Researched official government documents or statistics	35
Renewed a driver's license or car registration	33
Got recreational or tourist information from a government agency	30
Got advice or information from a government agency about a health or safety issue	25
Got information about or applied for government benefit	23
Got information about how to apply for a government job	19
Paid a fine, such as a parking ticket	15
Applied for a recreational license, such as a fishing or hunting license	11

SOURCE: Pew Internet and American Life Project, "Government online," April 27, 2010

97 ComScore Marketer.

98 Alexa, last 30 days, from March 14, 2011.

99 Anne Marie Perrault, An exploratory study of biology teachers' online information-seeking practices, American Association of School Librarians, 2009.

100 ComScore.

101 Pew Internet and American Life Project, Government online, April 27, 2010.

But of course, all this information and online service is valuable only because search makes it accessible. Search therefore creates value by raising awareness, better matching citizens' needs, making available long-tail content, problem solving, and saving time.

For example:

- The United Kingdom recently launched a Web site that provides records of all government expenses over £25,000 ($41,000). More than 20 percent of site traffic results from a search.[102]

- In Germany, PortalU provides government data on the environment with access to 500,000 database entries from more than 340 public organizations.[103] More than 20 percent of its site traffic comes from search engines.[104]

- The online listing of 20 million records of land ownership in the state of Karnataka in southwest India makes it possible for the 6.7 million farmers there to obtain copies of their land records at virtually no cost. Previously, farmers often had to pay bribes as well as absorb the cost of travel to get their documents.[105]

- Search helps governments raise awareness of key messages. In France, an anti-drug TV campaign told viewers to either call a phone number or go to the Web site www.drogues-info-service.fr. Over the period of the campaign, almost 55 percent of visits to the Web site[106] came via search.

Search creates value for government and its citizens in both monetary and nonmonetary terms. This report restricts itself to illustrating the potential monetary value by estimating the productivity gains of knowledge workers employed by governments as a result of time saved. The methodology is analogous to that used to estimate the productivity improvement of knowledge workers in enterprises, explained in the methodology.

Exhibit 23 shows that the value of the productivity gains in 2009 ranged from $0.3 billion to $0.5 billion in Brazil, to $3.7 billion to $5.6 billion in the United States.

Exhibit 23

Value of search to governments, 2009

	United States	Germany	France	Brazil	India
% of active population with a government job[1]	7.6%	6.9%	9.1%	10.6%	37.1%
% of knowledge workers in the labor force	41%	43%	41%	19%	15%
Value USD billions	$3.72–5.55	$0.83–1.24	$0.82–1.28	$0.32–0.53	$2.23–3.34

1 US government only—excludes teachers, doctors, administrative; Germany—includes teachers, doctors, administrative; France—includes teachers, doctors, administrative; India—includes whole public sector; Brazil—includes public sector except research, health, education.

SOURCE: US Bureau of Labor Statistics; Federal Statistical Office of Germany; INSEE; Economic Survey 2009–10 of India; Ipea; Rais; International Labor Organization; McKinsey Global Institute

102 Alexa, last 30 days, from March 14, 2011.
103 PortalU.de.
104 Alexa, last 30 days, from March 14, 2011.
105 United Nations Public Administration Network, Global Corruption Report, 2003,
     http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan008435.pdf.
106 Alexa, last 30 days, from March 14, 2011.

Comparative returns on investment

Previous research referred to earlier in this report has looked at the value that search offers advertisers in terms of their return on investment.

As previously detailed, advertisers do well, earning an average ROI of 7:1 from search-related advertising. Others constituencies fare better still.

Based on the value of time saved alone, individuals in our study—that is, individual information seekers and content creators, consumers, and entrepreneurs—earn an ROI of 10:1, on average.

Enterprises earn still more, with an ROI of 17:1 as a result of time saved.

The methodology explains these calculations in detail.

The economic value of search

Exactly how much value does search create? To date, no one has looked at its economic contribution at a country level, let alone a global level.

As described earlier, our research looked at nine sources of value for 11 constituencies in five countries. In some cases we were able to quantify the resulting value, and in others we were able to illustrate it only qualitatively. The methodology describes how we used this analysis to arrive at a global estimation of search value.

The analysis showed that search activity had measurable impact approaching gross annual value of $780 billion in 2009. This is a necessarily conservative figure, given that the research was limited in terms of the number of constituencies and sources of value analyzed. It is a significant figure nevertheless, making each search worth $0.50 and equivalent overall to the GDP of the Netherlands or Turkey in 2010.[107] Moreover, the speed at which the search environment evolves guarantees that this figure has already been surpassed.

Exhibit 24 shows how the value was divided among the five countries we studied.

Not all this value shows up in GDP. While corporate benefits in the form of higher productivity are captured, many consumer benefits, such as lower prices and time saved, are not. Some of these are likely to have an indirect impact on GDP. In addition, some sources of value in education and health care that we did not quantify also boost GDP directly. The estimate of search's impact on GDP should therefore be considered as conservative. It is nevertheless significant. The research showed gross value of $540 billion, or 69 percent of the measurable value, flowed through to GDP. This is roughly the size of the global print and publishing industry[108] or Switzerland's GDP.[109] The methodology describes in detail how search's contribution to GDP was estimated.

Exhibit 25 shows how search's contribution to GDP was spread across the five countries studied. Of the value created, around 70 percent contributed directly to GDP in the developed countries studied and 40 percent in the developing countries. This represents between 1.2 and 0.5 percent of each country's GDP.

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107 International Monetary Fund.
108 Includes publishing of books, brochures, musical books, newspapers, journals and periodicals, recorded media, and other publishing. Also includes printing, service activities related to printing, and reproduction of recorded media.
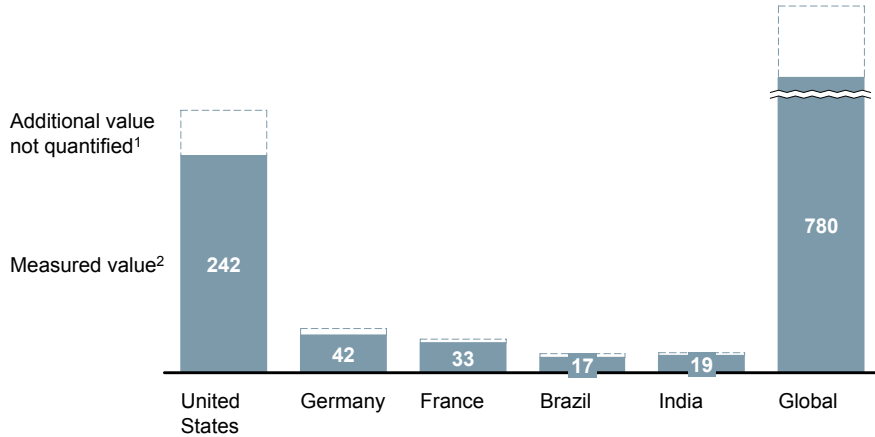109 International Monetary Fund.

Exhibit 24

Gross value created by search across countries, 2009

USD billions

ESTIMATES

Additional value
not quantified[1]

Measured value[2]

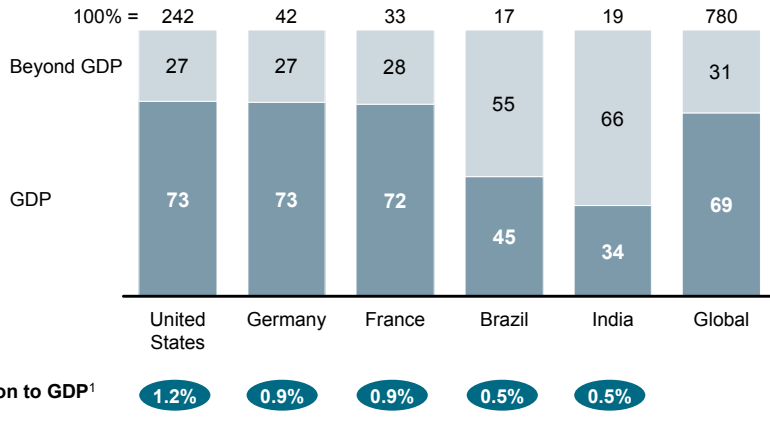|	United States	Germany	France	Brazil	India	Global
	242	42	33	17	19	780

1 These are only estimates and should not be taken out of context of the accompanying text.
2 These values are conservative. They include only quantified estimates and do not include value that we did not quantify, such
   as the improvement in the quality of a consumer's shopping experience from better matching.
SOURCE: McKinsey analysis

Exhibit 25

Value created by search across countries, 2009

Measured value
%; USD billions

ESTIMATES

100% =	242	42	33	17	19	780
Beyond GDP	27	27	28	55	66	31
GDP	73	73	72	45	34	69
	United States	Germany	France	Brazil	India	Global

| Contribution to GDP[1]
% | 1.2% | 0.9% | 0.9% | 0.5% | 0.5% | |

1 Represents only the portion of value that is attributable to GDP (e.g., the 73% of $242 billion in the United States).
SOURCE: McKinsey analysis

The large difference in the extent to which search contributes to GDP in developed and
developing countries can be explained by the much larger percentage of total value that
is captured in developing countries as a consumer surplus, which is not included in
GDP. That in turn is explained by developing countries' much larger populations. This
is reflected in Exhibit 26, showing that in the developed countries studied, companies
gain some 70 percent of the measurable search value. In developing countries, the
figure is around 40 percent. The exhibit also indicates the extent to which search
value is underestimated if one narrows the gauge to the search industry. It earns only
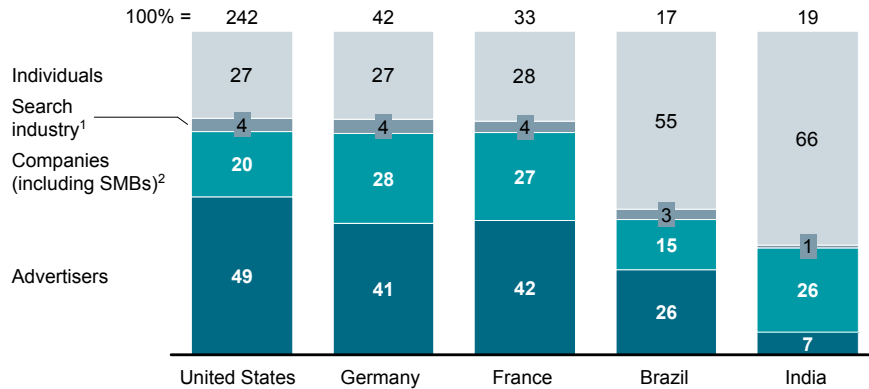4 percent of the value created.

Exhibit 26

Value created by search across countries, 2009

ESTIMATES

Measured value
%; USD billions

	United States	Germany	France	Brazil	India
100% =	242	42	33	17	19
Individuals	27	27	28	55	66
Search industry[1]	4	4	4		1
Companies (including SMBs)[2]	20	28	27	3	
				15	26
Advertisers	49	41	42	26	7

1 Search industry includes enterprise search, classified and local search, and search marketing.
2 SMBs = Small and medium-sized businesses.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey analysis

Yet despite the clear benefits of search to the economy, it would be a mistake to think about search only in monetary terms. For example, search helps people find information in times of emergencies, and it helps them seek out people with similar interests—perhaps a support group for those coping with disease. And it shifts the balance to empower individuals or small organizations with something to share that would otherwise reach only a small audience. None of these benefits may have an easily quantifiable economic value, but each has a positive impact on people's lives.

The future of search

Search is at an early stage of its evolution. For example, searches for video or photographic images still largely depend on text searches by file names or key words, not image searches. Likewise, services that identify scraps of music have not yet found a killer application, and technologies capable of capturing a sign in one language and translating it into another remain rudimentary. All this is work in progress.

At the same time, voice recognition has improved dramatically and is already changing the search habits of many mobile users. In addition, search technology is now being grafted onto other consumer electronics devices, and cameras are being used as scanners to read bar codes and in turn consult databases to do on-the-spot price comparisons. Although the future of search remains hard to predict given the pace of change, it seems likely that its value will only grow as we rely on it more and more.

Search technology will need to develop to keep pace with what it has helped unleash, namely, a fast-growing volume of online content: one study estimated that the amount of digital information will grow by a factor of 44 from 2009 to 2020.[110] Amid the trillions of gigabytes, the task of search technology will be to make sure the search is still quick and the results relevant. With so much more information available, the danger is that we might reach a point where the value of the time it takes to find

110 IDC Digital Universe Study, sponsored by EMC, May 2010.
    http://www.emc.com/about/news/press/2010/20100504-01.htm.
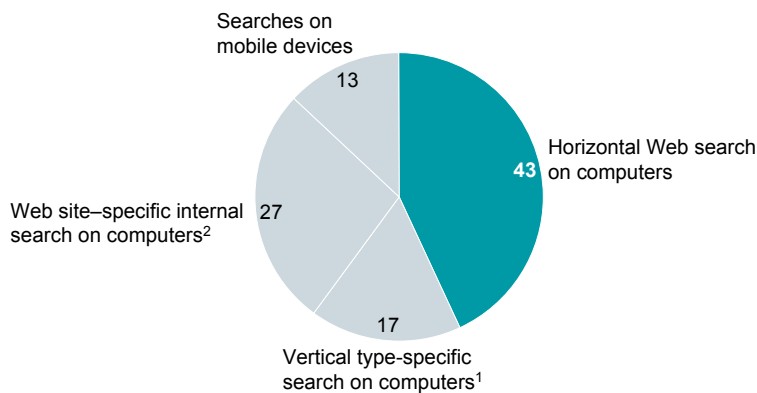
what we are searching for is higher than the utility of finding it. Conversely, the more powerful search becomes, the more value can be distilled from a mountain of data.

Accordingly, the use of vertical search engines is on the rise. As mentioned earlier, ten times as many product searches are now executed on Amazon and eBay, both vertical sites, as on Google Product Search.[111] And Exhibit 27 shows that the number of horizontal Web searches conducted on personal computers in the United States is outstripped by vertical and mobile searches.

Exhibit 27

Horizontal Web searches on traditional computers are now a minority of all searches performed in France

% of total searches performed in France, 2009

Searches on
mobile devices

13

Horizontal Web search
43 on computers

Web site–specific internal 27
search on computers[2]

17

Vertical type-specific
search on computers[1]

1 Searches for specific types of content, e.g., images, video, within maps.
2 Searches within a specific Web site, such as Amazon, YouTube, Wikipedia.

SOURCE: ComScore; McKinsey analysis

Interest in semantic search engines, which try to understand the underlying intent of a search more accurately, is also on the rise. The increasing difficulty of finding relevant content is marked by a rise in the number of words in a search query: from 2.9 words in 2008, on average, to 3.2 in 2010.[112]

Importantly, relevant search results are increasingly deemed to be personalized. Autonomous search agents that make suggestions based on personal data, including the user's location, metadata, and more advanced algorithms, are in sight. For example, Surf Canyon, a US company, is developing real-time, personalized search capabilities that transform static lists of search results into dynamic pages that rerank results based on a user's real-time, online activity.

The importance of personalized information is also reflected in the way key players in the search industry now use the data available on social networks to enhance search results. For example, users of the Facebook social network can tag content on the Web that they find interesting by pressing a "Like" button. When a user then conducts a search, pages "Liked" by their friends will help determine the ranking of the search results, on the assumption that this makes them more relevant.

111 ComScore qSearch.

112 ComScore.

The advent of smartphones, tablets, and other Web-connected portable devices increases the potential of more personalized searches. From 2008 to 2010, mobile search traffic in most markets grew fourfold.[113] Today, some 25 percent of mobile users conduct searches on their wireless phones in the United States, as do slightly more than 30 percent in Japan, even though many still do not use smartphones. It has also been shown that people tend to search for local services more on their mobile devices than on their PCs.[114]

As search continues to grow, new applications will undoubtedly emerge. Already, analysis of what people are searching for is being used not only to make search results more relevant but also to better understand current trends and future outcomes in society. Researchers have, for example, looked at how search activity can help predict epidemics, unemployment, consumer demand, or even stock prices. (See Box 4, "The predictive value of search.")

So what does all this mean for those who participate in the search market?

Individuals have much to look forward to. Fueled by fierce competition among search providers, the power of search is set to keep rising. Individuals will be able to conduct their searches on a range of devices, anytime, anywhere. They will be able to search more quickly and more easily than before—with voice recognition, for example. And they can expect increasingly relevant results.

The downside to be considered is that just as search enables individuals to uncover more and more information, so it makes it easier for others to uncover information about them in what some may consider an invasion of privacy.

Organizations of every hue will benefit in similar ways and perhaps have even more to gain as they have sometimes been slower than consumers to capture some of the potential power of search. Cutting-edge IT innovation once mostly occurred within enterprises that enjoyed multimillion-dollar budgets to purchase servers, deploy networks, and implement large and complex software applications. Today, search innovation has been more prolific in consumer applications, and many would argue that search technology for consumers is superior to the search tools that employees in large corporations use to find information within the enterprise.

Participants in the search market—advertisers, portals, search engines, and those that provide search platforms—are in for a turbulent ride. The competition is fierce, and as technology change accelerates, incumbents will be constantly challenged and disruptive change will become the norm. The rise of social networks marks one current industry shift that raises question about the balance between pure logic-driven, algorithmic searches and people-influenced, social searches. Fragmentation of the marketplace, by verticals, geographies (as some governments impose various types of regulatory controls), and the devices used for searching, will also make competing in the search market increasingly complex.

Policy makers will find themselves challenged as search gives rise to a whole host of issues that are difficult to arbitrate, given the ease with which information can be accessed through search. Privacy often grabs attention. Other salient issues include infringement—with many companies arguing that search engines should not index

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113 McKinsey analysis of data from Strategy Analytics, RBC Capital Markets, comScore, and Gartner press release, "Gartner says worldwide PC shipments on pace to grow 22 percent in 2010," May 26, 2010.

114 Jane Li, Scott B. Huffman, and Akihito Tokuda, *Good abandonment in mobile and PC Internet search,* Proceedings of the 32nd International ACM SIGIR Conference on Research and Development in Information Retrieval, July 19–23, 2009, Boston, MA.

certain copyrighted or trademark-related words, images, text, or video—as well as censorship.[115] Some governments are condemned for using key-word-sniffing filters to snuff out dissident opinion; others are applauded for cracking down on, say, online gambling. Both could be argued to infringe on online freedom, making it one of the toughest issues confronting technology policy.

Moreover, any attempt by policy makers to arbitrate the interests of the different constituents in the fast-paced virtual world will likely leave them playing catch-up. Public policy tends to change much more slowly than both IT and public opinion, and online activity often escapes the bounds of any institutional frameworks that policy makers might try to impose. Laws that prevent the reporting of matters sub judice, for example, are hard to enforce on the likes of Twitter or Facebook, and search ensures a ready audience.

Researchers, too, will be playing catch-up, trying to make sense of it all. But amid all the uncertainty, one thing is sure: the full implications of search on economies and societies are only now beginning to be revealed.

Box 4: The predictive value of search

Economists have long recognized that the right information[1] can help anticipate economic trends. Today, much economic data are backward-looking, with unemployment data, for example, released several days after the end of the month. In contrast, key word searches, Tweets, or Facebook activity can be tracked in real time, lending valuable insights. For example, the volume of searches for, say, "automotives and shopping" in late February may help predict March sales way ahead of the March data.[2] In a fast-changing world, knowing what is happening in the present can prove to be a crucial tool for policy makers in formulating appropriate and timely responses.[3]

Here are a few examples of how analysis of what people are searching for can help to better understand present trends and predict future outcomes.

- **Health care.** In health care, research has shown that an analysis of search activity can give up to one to two weeks' warning of a disease spreading before disease control authorities report on such problems.[4]

- **Financial markets.** Research has shown that the level of searches for stock tickers can predict abnormal stock returns and trading volumes.[5] Other research has looked at stock market movements in relation to the public mood as interpreted by the text content of daily Twitter feeds.[6]

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1   George Stigler, "The economics of information," *Journal of Political Economy,* June 1961, Volume 61, Number 3, pp. 213–225.
2   See Hal R. Varian and Hyunyoung Choi, *Predicting the present with Google trends,* April 2, 2009, Google Research Blog, http://googleresearch.blogspot.com/2009/04/predicting-present-with-google-trends.html.
3   For further discussion, see Florian Bersier, *Towards better policy and practice using real-time data,* March 12, 2010, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1614970.
4   Jeremy Ginsberg, Matthew Mohebbi, Rajan Patel, Lynnette Brammer, Mark Smolinski, and Larry Brilliant, "Detecting influenza epidemics using search engine query data," *Nature,* Volume 457, February 19, 2009, pp. 1012–1014.
5   Joseph Kissan, M. Babajide Wintoki, and Zelin Zhang, "Forecasting abnormal stock returns and trading volume using investor sentiment: Evidence from online search," upcoming, *International Journal of Forecasting.*
6   Johan Bollen, Huina Mao, and Xiao-Jun Zeng, "Twitter mood predicts the stock market," *Journal of Computational Science,* March 2011, Volume 2, Number 1, pp. 1–8.

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115   Hannibal Travis, "The future according to Google: Technology policy from the standpoint of America's fastest-growing technology company," *Yale Journal of Law & Technology,* Spring 2008–09, Volume 11.

> **Box 4: The predictive value of search (continued)**
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> ■ **Real estate.** Studies have shown that search activity can help predict housing prices and sales. One piece of research showed a strong correlation between home sales and the share of US Internet searches for "homes for sale."[7] Another showed that errors in predicting future housing sales were cut by a factor of four when using search data compared with using other indexes.[8]
>
> ■ **Commercial success.** Researchers examined whether search query volumes could predict the opening-weekend box-office revenue for feature films, the first-month sales of video games, and the rank of songs on the US Billboard Hot 100 chart. In all cases, search counts were highly predictive.[9]
>
> ■ **Economic trends.** German research, among other, has suggested strong correlations between key word searches and unemployment rates[10] as well as links between search data and the ability to better predict consumer confidence.[11]
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> 7   Hopkins, Heather, "Internet searches match decline in existing home sales—revised," *Hitwise,* April 25, 2008, http://weblogs.hitwise.com/us-heather-hopkins/2008/04/Internet_searches_match_declin_1.html.
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> 8   Lynn Wu and Erik Brynjolfsson, *The future of prediction: How Google searches foreshadow housing prices and sales,* ICIS 2009 Proceedings, 2009.
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> 9   Shared Goel, Jake M. Hofman, Sébastien Lahaie, David M. Pennock, and Duncan J. Watts, *Predicting consumer behavior with Web search,* Yahoo! Research, WWW 2010 Conference, April 26–30, 2010, Raleigh, NC.
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> 10 Nikos Askitas and Klaus F. Zimmermann, *Google econometrics and unemployment forecasting,* German Council for Social and Economic Data, research notes, Number 41.
>
> 11 Torsten Schmidt and Simeon Vosen, *A monthly consumption indicator for Germany based on Internet search query data,* Ruhr Economic Paper Number 208, October 15, 2010.

Appendix: Methodology

The methodologies used to estimate the monetary value of search accrued by each of the constituencies have either been used elsewhere, reflect common sense, or are the best we could deploy given the available data. Where no data were available, or where the methodology was not robust, no attempt was made to quantify value. Hence, the estimates made in this report only partially reflect the overall value of search. Where it was not possible to quantify a particular source of value, we illustrate its impact qualitatively. We also illustrate the nonmonetary value of search.

Gross valuation estimates

The estimates reflect the gross value of search, and some of those benefits are not necessarily fully incremental—for example, about 20 percent of online searches in the United States lead to retail sales, be they online or offline, but some percentage of those purchases would have likely occurred even if consumers were not able to search online. Also, with regard to time saved, the fact that individual information seekers save time performing an individual search does not necessarily mean that they will reduce the overall amount of time they spend searching. They might simply conduct more searches in the same amount of time.

The following explains how search value was measured for each of the constituencies:

Advertisers

We quantified the value of search to advertisers[116] by estimating the ROI earned from paid search advertising (both online and mobile), SEO, and online classified advertising. We use a gross ROI of 9:1 (revenue:cost) for paid search and SEO in the United States based on various academic papers. For example, the value of advertising clicks has been assessed as a ratio of between $2 and $2.5 to $1,[117] and advertisers receive an average of 5 to 5.3 clicks on their search results for every one click on their advertisements when both search and advertising links appear on a page.[118] ROI was then adjusted by country to account for different levels of online advertising effectiveness (measured as [(e-commerce + ROPO[119])/(online advertising spend)]).

The ROI for online classified advertising was derived from a comScore/IAB study that estimates the ROI to be 10, of which 50 percent is attributable to search.[120]

Retailers

We quantified the value of search for retailers as the value of sales that occur because search was used at some stage in the decision-making process. This was calculated as the sum of e-commerce sales attributed to search plus ROPO. It was calculated by synthesizing the results of three sets of analyses: the ROI impact of search advertising and SEO expenditures in each country;[121] the touch points related to search at different points in the customer decision journey;[122] and the total number of searches and conversion rates.[123]

Content creators

We quantified two sources of search value for content creators: revenue from search-related advertising and revenue from content sales.

Value from advertising was estimated as the revenue content creators receive as a result of the advertising impressions driven by search. We conservatively estimated that between 20 and 25 percent of total online display advertising spend and other online advertising spend—for example, online video and rich media advertising—resulted from horizontal Web searches, and 5 to 7 percent from internal searches.

Our estimate of revenue from content sales leverages the analysis for the retail constituency. Retail value for content creators was estimated as e-commerce sales

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116 When calculating the value, we defined advertisers as organizations that use paid search advertising as well as those that benefit from natural search.

117 Hal R. Varian, "Online ad auctions," *American Economic Review: Papers & Proceedings 2009,* Volume 99, Number 2, pp. 430–434, http://www.aeaweb.org/articles.php?doi=10.1257/aer.99.2.430; Ashish Agarwal, Kartik Hosanagar, and Michael D. Smith, "Location, location, location: An analysis of profitability of position in online advertising markets," *Journal of Marketing Research,* forthcoming, http://ssrn.com/abstract=1151537; Misra, Sanjog, Edieal Pinker, and Alan Rimm-Kaufman, *An empirical study of search engine advertising effectiveness,* WISE 2006, Evanston, IL, December 9–10, 2006, http://digital.mit.edu/wise2006/papers/4A-2_PinkeretalWISE2006.pdf.

118 Bernard J. Jansen and Amanda Spink, "Investigating customer click through behaviour with integrated sponsored and nonsponsored results," *International Journal of Internet Marketing and Advertising,* 2009, Volume 5, Numbers 1/2, pp. 74–94.

119 Research Online-Purchase Offline, that is, the purchases made offline due to online research.

120 ComScore/IAB, Classifieds ROI, 2006, paper presented at IAB Leadership Forum: Performance Marketing Optimization, Chicago, March 13, 2006, http://www.iab.net/media/file/resources_admin_downloads_IAB_comScoreExecPreso.ppt. Used the 10:1 found across all categories of the Verizon Superpages.

121 Hal R. Varian, "Online ad auctions," *American Economic Review: Papers & Proceedings 2009,* Volume 99, Number 2, pp. 430–34, http://www.aeaweb.org/articles.php?doi=10.1257/aer.99.2.430.

122 McKinsey primary research, Digital Marketing Survey, 2007.

123 ComScore, Nielsen.

for the product subcategory of books and music and video by country and the ROPO coefficient for that subcategory by country. We assumed that around 30 percent of that value goes to content creators and that the remainder goes to distributors.

We did not attempt to quantify any value for business-to-business content creators or content creators who sell on a subscription basis, although considerable value lies here.

Enterprise

As a gauge of search value to enterprise, we calculated the value of the productivity gains made by knowledge workers.

Several existing studies have demonstrated significant productivity gains from search in different geographies.[124] We assume a conservative 10 to 15 percent gain in productivity for enterprise knowledge workers, and we assume that knowledge workers spend on average five hours per week, or about 12 percent of their time, searching online. We then took into account local wages and the number of knowledge workers per country to arrive at an estimate of the value of search in the five countries studied.

The ROI for enterprises was calculated based on an investment that took into account how much enterprises spent to deploy internal search capabilities and the amount they spent for Internet access that could be related to search. The return was based on the time saved as previously described.[125]

Consumers

This constituency consists of consumers who use search for transactional purposes, regardless of whether the purchase is eventually made online or off.

Specific estimates were calculated for the value of the time consumers save by searching for goods online and the consumer surplus they get from price transparency and better matching in the long tail.

The time saved was calculated by determining a value for an hour of a consumer's leisure time and multiplying it by the amount of time consumers saved searching while conducting purchases online. The value of a consumer's leisure time was valued at between $0.5 and $7 per hour,[126] based on average, after-tax income per household in each country, and the assumption that a consumer's leisure time was worth 65 percent of this figure.[127] Online search saves around 15 minutes per query.[128] This would imply that consumers can save up to 20 hours per year, based on estimates of the number of their searches.

124 Yan Chen, Grace YoungJoo Jeon, and Yong-Mi Kim, A day without a search engine: An experimental study of online and offline search, working paper, School of Information, University of Michigan, 2010, http://yanchen.people.si.umich.edu/papers/VOS_20101115.pdf; The hidden costs of information work, IDC white paper, March 2005; McKinsey proprietary survey of French small and medium-sized businesses, 2010.

125 Primary McKinsey & Company research.

126 Austan Goolsbee and Peter J. Klenow, *Valuing consumer products by the time spent using them: An application to the Internet,* paper prepared for the American Economic Association session on "The roots of innovation," Boston, MA, January 8, 2006.

127 Sergio Jara-Díaz, Marcela Munizaga, Paulina Greeven, Reinaldo Guerra, and Kay Axhausen, "Estimating the value of leisure from a time allocation model," *Transportation Research Part B: Methodological,* December 2008, Volume 42, Number 10, pp. 946–957.

128 Yan Chen, Grace YoungJoo Jeon, and Yong-Mi Kim, *A day without a search engine: An experimental study of online and offline search,* working paper, School of Information, University of Michigan, 2010, http://yanchen.people.si.umich.edu/papers/VOS_20101115.pdf.

The consumer surplus from price transparency was estimated by multiplying the average decrease in price resulting from search by the percentage of transactions enabled by search by the total value of e-commerce in each country. The total consumer surplus from better matching in the long tail was estimated by multiplying the value of long-tail searches resulting from search by the consumer surplus factor identified in academic studies.

The value of other consumer surplus, e.g., better matching that is not in the long tail, or the convenience of online shopping, is computed as the total consumer surplus (estimated using a derived demand curve) minus the values calculated for time saved, price transparency, and long-tail matching.

Individual information seekers

The value of search to individual information seekers is regarded as the sum of the value derived from horizontal Web searching and other informational searching, and the value of searches for entertainment.

To value these components, conjoint analysis was performed in the United States, France, Germany, and Russia, in which individuals were asked to value certain services on the Internet such as Web searches, access to directories, and social networks. We then estimated the impact of search on each of these services based on estimates of the percentage of pages viewed per category that result from search. Gross value was calculated as the value per Internet user per country, multiplied by the total number of Internet users. The number of Internet users is based on 2009 figures.[129] The numbers for Russia were applied to India and Brazil. The three countries have roughly the same broadband Internet penetration (around 30 percent), and similar proportions of their populations watch videos online (20 to 30 percent). The monthly price of a broadband connection is currently about $15 in India and Russia and $30 in Brazil. We excluded entertainment value for nonbroadband users.

ROI for individuals

The ROI for individuals in their roles as consumers and individual information seekers was based on an investment that included a fraction of their total Internet expenses, based on the percentage of what they would pay for search versus other Internet services, i.e., approximately 20 percent. The return was estimated based on what individuals would pay in their roles as consumers and individual information seekers.[130]

Entrepreneurs, individual content creators, health care, education, government

These were not quantified.

Methodology for calculating the total value of search

The bottom-up values estimated for the various constituencies cannot be added to give country-level estimates because there are certain overlaps. For example, retailers are also advertisers, so simply adding these two values together would be to partly double count. Therefore, to estimate the total value of search, we used a top-down methodology.

We began by estimating the total value of search in each of the five countries. This was done by estimating the three categories of value creation that have a direct impact

129 Sources on Internet users included BVH, Forrester, Euromonitor, e-bit WebShoppers, Fevad, Online Travel Industry in India 2010, Euromonitor International.

130 McKinsey & Company for IAB Europe, *Consumers driving the digital uptake: The economic value of online advertising-based services for consumers,* September 2010.

on GDP; the indirect contribution to GDP from ROPO; and two categories of value creation that are not included in GDP measures.

The three categories of value that have a direct impact on GDP are the productivity gains enjoyed by enterprises, the value accrued by advertisers, and the profits made by search engine providers. We took an income approach to estimating GDP impact. To estimate the productivity gains made by enterprise as a result of search, we applied the methodology previously described for this particular constituency. To estimate the value that accrues to advertisers, we used the same ROI-based methodology already described. We estimated the profits generated by search engine providers by multiplying the gross margins for different types of search-related advertising by the total spent on advertising in each country.

The two categories not captured in GDP statistics for which we estimated a value were the surplus to consumers and the surplus to individual information seekers. The methodology for measuring these two categories is previously described under the relevant sections.

Having estimated the value of search in each of the five countries studied, we estimated the global value of search by scaling up our findings. The average value of search as a percentage of GDP in France and Germany was applied to other developed economies, and the average value of search as a percentage of GDP for Brazil and India was applied to other developing economies.

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The networked enterprise holds steady

Organizations continue to absorb more and more Internet technologies—in particular they are finding more uses for social tools and collaborative technologies. The odds of using those technologies pervasively and effectively are high, with heavy use companies demonstrating better results than the others in improving margins and market share. However, major benefits do not come easily. Those companies adapting core processes, and an organization structure that mimics the network structure of these technologies, are for now a minority—but they are reaping the most financial benefits from web technologies.

Dr. Jacques Bughin, Dr. Michael Chui, and Dr. Angela Hung Byers

Social tools and technologies, known collectively as Web 2.0, continue to reshape how organizations reach out to employees, customers, and business partners, and how they approach such diverse responsibilities as setting strategy and managing projects, according to our fifth annual survey of executives around the world.[1] On the whole, executives report that their companies are using more of these technologies, the vast majority of those using them are achieving business benefits, and adoption is taking root across many processes. As in past surveys, we asked respondents which technologies their organizations deploy, whether organizations derive measurable benefits (and what those are), and how these technologies will affect the way their companies are organized. Confirming findings from last year, we again found a small core of highly networked organizations—those that use these technologies the most and derive the most benefits from them, according to their executives. For the first time, we asked respondents to think forward about more profound changes that social technologies could bring to their organizations as remaining barriers to usage recede. Executives expect the greatest changes will involve monitoring the behavior of consumers and competitors and finding new ideas for cost savings and product innovation.

Networking for business benefits

Social technologies relentlessly morph and improve; perhaps in response, survey respondentshave consistently reported overall increases in their organizations' adoption of them (Exhibit 1). This year, social networking made the biggest gains and

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1   The online survey was in the field from June 7 to June 17, 2011, and received responses from 4,261 executives representing the full range of regions, industries, tenures, and func¬tional specialties.
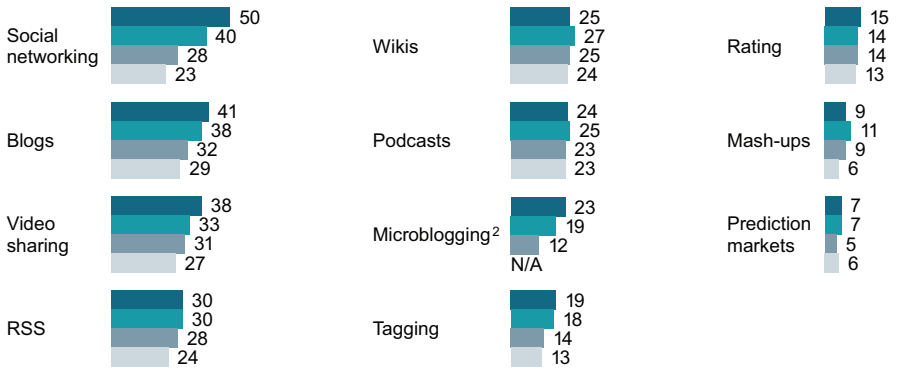
increased its lead over other popular technologies such as blogs and video sharing. Seventy-two percent of respondents say their companies currently use at least one social technology.

Exhibit 1

Adoption rates continue to climb

% of respondents[1] whose companies use each technology

- 2011, n = 4,261
- 2010, n = 3,249
- 2009, n = 1,695
- 2008, n = 1,988

Social tools and technologies currently used by companies

Social networking	Wikis	Rating
50 / 40 / 28 / 23	25 / 27 / 25 / 24	15 / 14 / 14 / 13

Blogs	Podcasts	Mash-ups
41 / 38 / 32 / 29	24 / 25 / 23 / 23	9 / 11 / 9 / 6

Video sharing	Microblogging[2]	Prediction markets
38 / 33 / 31 / 27	23 / 19 / 12 / N/A	7 / 7 / 5 / 6

RSS	Tagging	
30 / 30 / 28 / 24	19 / 18 / 14 / 13	

1 Respondents who answered "don't know" are not shown.
2 Microblogging was not offered as a technology in the 2008 survey.

As more organizations are using these tools, executives report applying them in a variety of important processes. Respondents say their organizations use social tools and technologies to improve their understanding of external environments, find new ideas, and manage projects and employees, for example (Exhibit 2). They report that different tools are useful for different processes.

Exhibit 2

Technologies are used across processes

% of respondents[1] whose companies used at least 1 social technology

- 20–40%
- 10–20%
- 5–10%
- <5%

How companies are using social technologies

	Total, n = 3,103	Social networking, n = 1,728	Blogs, n = 1,322	Video sharing, n = 769	RSS, n = 642	Wikis, n = 809	Podcasts, n = 502	Micro-blogging, n = 654	Tagging, n = 347	Rating, n = 348	Mash-ups, n = 203	Prediction markets, n = 190
Scanning external environment	75	40	29	11	14	9	8	13	6	5	4	5
Finding new ideas	73	36	29	11	10	12	7	13	4	4	3	4
Managing projects	55	19	12	11	5	17	4	5	4	3	2	2
Developing strategic plan	43	16	11	8	4	8	4	5	3	3	2	4
Allocating resources	30	10	5	4	3	4	2	2	1	2	2	2
Matching employees to tasks	29	11	4	4	2	5	2	3	2	2	2	1
Assessing employee performance	26	7	4	3	2	3	1	2	1	4	1	1
Determining compensation	20	6	4	2	1	2	1	1	1	3	1	1

1 Respondents who answered "other" are not shown.

As in earlier surveys, we asked executives about the measurable benefits their organizations are getting from using these tools and technologies in three different types of interactions: among employees, with customers, and with business partners, suppliers, and outside experts. Nine out of ten respondents whose organizations are using social technologies report some degree of benefits, matching last year's high levels. Across most types of benefits, the percentage of respondents reporting gains from using these technologies is about the same as it was last year (Exhibit 3). However, respondents report a few improvements. Among those using social technologies for customer-related purposes, for instance, a greater share report benefits related to marketing effectiveness, and those using these tools for partner and supplier interactions report increased speed to accessing knowledge and experts as well as reduced communications costs.
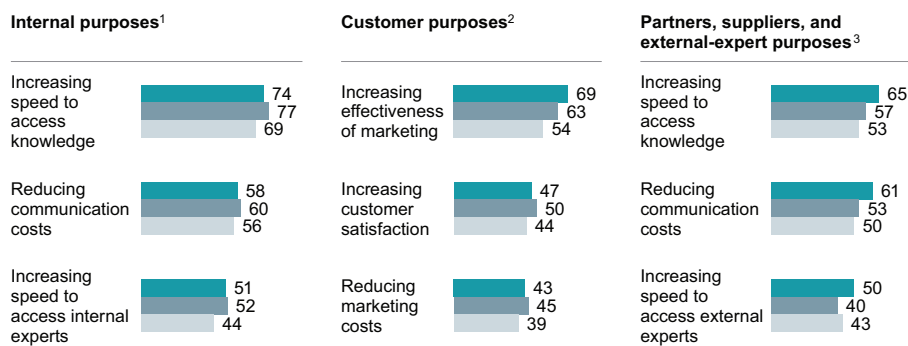
Exhibit 3

Benefits remain consistent over time

% of respondents reporting at least 1 measurable benefit at their companies

■ 2011
■ 2010
■ 2009

Top 3 measurable benefits of technology adoption, by use

Internal purposes[1]	Customer purposes[2]	Partners, suppliers, and external-expert purposes[3]
Increasing speed to access knowledge — 74, 77, 69	Increasing effectiveness of marketing — 69, 63, 54	Increasing speed to access knowledge — 65, 57, 53
Reducing communication costs — 58, 60, 56	Increasing customer satisfaction — 47, 50, 44	Reducing communication costs — 61, 53, 50
Increasing speed to access internal experts — 51, 52, 44	Reducing marketing costs — 43, 45, 39	Increasing speed to access external experts — 50, 40, 43

1 In 2011, n = 1,949; in 2010, n = 1,598; in 2009m n = 1,008
2 In 2011, n = 2,227; in 2010, n = 1,708; in 2009m n = 956
3 In 2011, n = 1,142; in 2010, n = 1,008; in 2009m n = 686

Shifts in networked enterprises

In our analysis of last year's survey results, we identified a small group of respondents at what we call "networked organizations," characterized by their reports of high levels of benefits when using social technologies with employees, customers, and partners and suppliers. Based on the benefits these respondents reported at their respective companies, we defined these networked organizations as being either internally networked, externally networked, or fully networked; we categorized the remaining group—most respondents—as "developing." As in 2010, this year's results show that in general, higher shares of employees, customers, or partners and suppliers use social technologies at networked organizations than at developing organizations (Exhibit 4). In addition, far more executives at fully networked organizations say these tools and technologies are integrated into employees' day-to-day tasks. This group is also more likely to report using social technologies in a range of business processes than respondents who say their organizations are internally networked, externally networked, or developing.

Interestingly, among the small number of executives (147 in all) who responded to both the 2010 and 2011 surveys and indicated that their organizations were networked—internally, externally, or fully—in at least one of those years, many indicate that their organizations shifted categories (Exhibit 5). About half of organizations that were internally and externally networked last year, for example, fell back into the developing category this year. The number of externally networked companies swelled, while substantially fewer were internally networked, and the ranks of fully networked organizations grew slightly.

Exhibit 4

Networked organizations see higher levels of benefits, usage, and integration

		Organizational type based on social-technology benefits			
		Developing, n = 2,413	Internally networked, n = 224	Externally networked, n = 365	Fully networked, n = 101
Improvement in benefits, mean %	Internal benefits	2	18	8	26
	Customer benefits	1	3	13	21
	Partner benefits	1	2	11	24
Extent of social-technology usage, % of respondents	% of employees	39	37	43	48
	% of customers	26	37	54	51
	% of partners	40	48	55	64
Integration, % of respondents	Very or extremely integrated into employees' day-to-day work	18	49	45	80

Exhibit 5
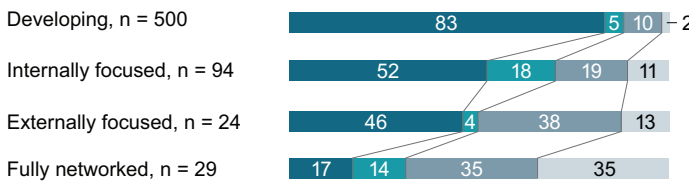
Sizeable shifts in network classifications

% of repeat respondents[1]

Organizational type based on social-technology benefits

■ Developing ■ Internally networked ■ Externally networked ■ Fully networked

Organizational type, 2011 — **Shifts in organizational types,** 2011

Developing, n = 500: 83 | 5 | 10 | 2
Internally focused, n = 94: 52 | 18 | 19 | 11
Externally focused, n = 24: 46 | 4 | 38 | 13
Fully networked, n = 29: 17 | 14 | 35 | 35

Distribution of organizational types, n = 647

2010: 77 | 15 | 4 | 4
2011: 74 | 7 | 13 | 5

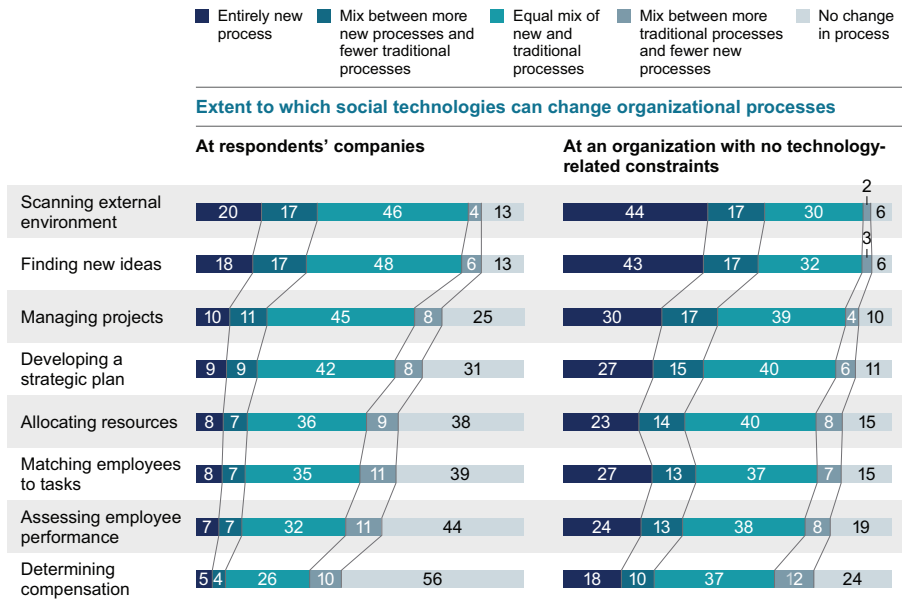1 Figures may not sum to 100%, because of rounding.

The organization of the future

While adoption of some social tools has grown steadily over recent years as technology has improved and use has broadened among all sectors of society, we believe the overall impact of social technologies on how organizations are structured and managed is in the early stages. To get a clearer view of how organizations might evolve as they use these tools more and more, we asked respondents about Web 2.0–related changes in their business processes that were likely to occur in their companies, versus what could happen if all constraints were lifted (Exhibit 6). Most answered that in today's environment, these tools and technologies would most likely have a modest effect on process change, enabling a mix of traditional and new processes. However, most respondents envisioned more significant change in the absence of constraints, as these tools would be much more likely to spawn greater adoption of entirely new processes in areas such as scanning the environment, finding new ideas, and managing projects.

Exhibit 6

Lifting constraints could change how tools are used

% of repeat respondents,[1] n = 4,261

Legend:
- Entirely new process
- Mix between more new processes and fewer traditional processes
- Equal mix of new and traditional processes
- Mix between more traditional processes and fewer new processes
- No change in process

Extent to which social technologies can change organizational processes

	At respondents' companies	At an organization with no technology-related constraints
Scanning external environment	20 / 17 / 46 / 4 / 13	44 / 17 / 30 / 2 / 6
Finding new ideas	18 / 17 / 48 / 6 / 13	43 / 17 / 32 / 3 / 6
Managing projects	10 / 11 / 45 / 8 / 25	30 / 17 / 39 / 4 / 10
Developing a strategic plan	9 / 9 / 42 / 8 / 31	27 / 15 / 40 / 6 / 11
Allocating resources	8 / 7 / 36 / 9 / 38	23 / 14 / 40 / 8 / 15
Matching employees to tasks	8 / 7 / 35 / 11 / 39	27 / 13 / 37 / 7 / 15
Assessing employee performance	7 / 7 / 32 / 11 / 44	24 / 13 / 38 / 8 / 19
Determining compensation	5 / 4 / 26 / 10 / 56	18 / 10 / 37 / 12 / 24

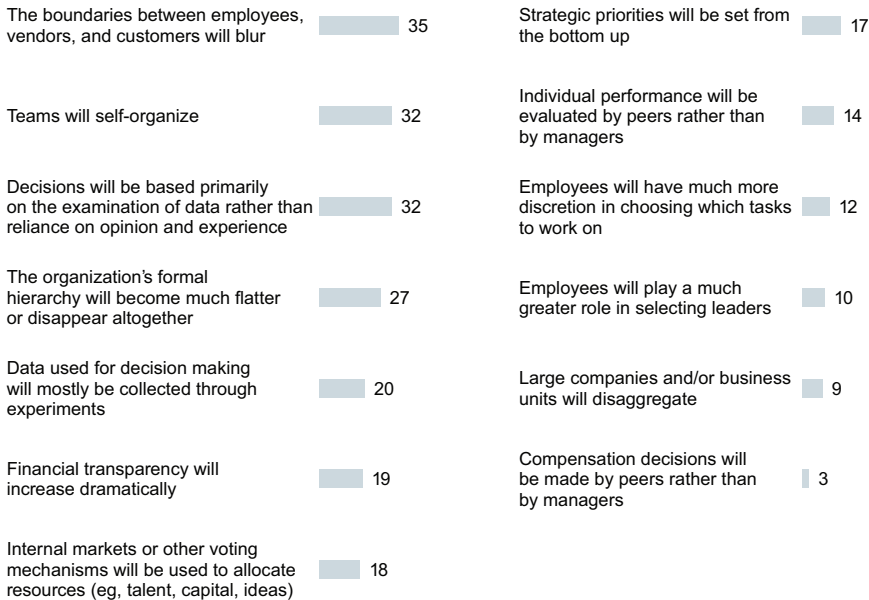1 Respondents who answered "don't know" are not shown.

Beyond processes, a number of respondents see the potential for more substantial organizational change (Exhibit 7). Thirty-five percent believe that, in the absence of constraints, social technologies would enable organizations to be less siloed and more open to outside stakeholders in the next three to five years. Slightly fewer would expect to see more organic management practices, in which teams self-organize using the Web. Smaller shares also expect that decisions will be guided by hard data rather than opinion and management experience, and that hierarchies would be less relevant.

Exhibit 7

Barring constraints, a number of potential organizational and process changes

% of repeat respondents,[1] n = 4,261

Likeliest organizational changes in the next 3-5 years, without constraints

The boundaries between employees, vendors, and customers will blur	35	Strategic priorities will be set from the bottom up	17
Teams will self-organize	32	Individual performance will be evaluated by peers rather than by managers	14
Decisions will be based primarily on the examination of data rather than reliance on opinion and experience	32	Employees will have much more discretion in choosing which tasks to work on	12
The organization's formal hierarchy will become much flatter or disappear altogether	27	Employees will play a much greater role in selecting leaders	10
Data used for decision making will mostly be collected through experiments	20	Large companies and/or business units will disaggregate	9
Financial transparency will increase dramatically	19	Compensation decisions will be made by peers rather than by managers	3
Internal markets or other voting mechanisms will be used to allocate resources (eg, talent, capital, ideas)	18		

1 Respondents who answered "none of the above" or "don't know" are not shown.

Looking ahead

- The benefits of the networked organization are real. Senior executives should promote stronger links to customers and vendors, and greater internal integration of technologies, since these factors are associated with higher levels of benefits.

- As the adoption of social tools and technologies continues to rise and as more progressive companies implement them to improve processes, using these tools well can improve overall competitiveness. Indeed, many companies that respondents reported as networked organizations last year saw lower levels of benefits this year, suggesting that companies need to make social technologies work, or the benefits might fade away.

- Companies should plan for more substantial disruption. Since many executives believe that significant changes will occur as (or if) constraints to Web 2.0 are lifted, companies that can create change themselves—instead of reacting to it—are likely to benefit the most.

The big data revolution

Articles in this section

Big data: The next frontier for innovation, competition, and productivity

From users sharing an exponential amount of multi-media data to companies churning out trillions of bytes of transactional information, and millions of networked sensors creating the "Internet of Things", digital data have become a torrent—flowing into every area of the global economy. The impact of this big data is larger than one thinks, creating major productivity gains, economic surplus shift, and labor skills shortage.

Brad Brown, Dr. Jacques Bughin, Dr. Michael Chui, Richard Dobbs, Dr. Angela Hung Byers, Dr. James Manyika, and Charles Roxburgh

Data have become a torrent flowing into every area of the global economy.[1] Companies churn out a burgeoning volume of transactional data, capturing trillions of bytes of information about their customers, suppliers, and operations. Millions of networked sensors are being embedded in the physical world in devices such as mobile phones, smart energy meters, automobiles, and industrial machines that sense, create, and communicate data in the age of the Internet of Things.[2] Indeed, as companies and organizations go about their business and interact with individuals, they are generating a tremendous amount of digital "exhaust data," i.e., data that are created as a by-product of other activities. Social media sites, smartphones, and other consumer devices including PCs and laptops have allowed billions of individuals around the world to contribute to the amount of big data available. And the growing volume of multimedia content has played a major role in the exponential growth in the amount of big data (see Box 1, "What do we mean by 'big data'?"). Each second of high-definition video, for example, generates more than 2,000 times as many bytes as required to store a single page of text. In a digitized world, consumers going about their day—communicating, browsing, buying, sharing, searching—create their own enormous trails of data.

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1   See "A special report on managing information: Data, data everywhere," *The Economist,* February 25, 2010; and special issue on "Dealing with data," *Science*, February 11, 2011.

2   "Internet of Things" refers to sensors and actuators embedded in physical objects, connected by networks to computers. See Michael Chui, Markus Löffler, and Roger Roberts, "The Internet of Things," *The McKinsey Quarterly,* March 2010.

Box 1. What do we mean by "big data"?

"Big data" refers to data sets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze. This definition is intentionally subjective and incorporates a moving definition of how big a dataset needs to be in order to be considered big data—i.e., we don't define big data in terms of being larger than a certain number of terabytes (thousands of gigabytes). We assume that, as technology advances over time, the size of data sets that qualify as big data will also increase. Also note that the definition can vary by sector, depending on what kinds of software tools are commonly available and what sizes of data sets are common in a particular industry. With those caveats, big data in many sectors today will range from a few dozen terabytes to multiple petabytes (thousands of terabytes).

In itself, the sheer volume of data is a global phenomenon—but what does it mean? Many citizens around the world regard this collection of information with deep suspicion, seeing the data flood as nothing more than an intrusion of their privacy. But there is strong evidence that big data can play a significant economic role to the benefit not only of private commerce but also of national economies and their citizens. Our research finds that data can create significant value for the world economy, enhancing the productivity and competitiveness of companies and the public sector and creating substantial economic surplus for consumers. For instance, if US health care could use big data creatively and effectively to drive efficiency and quality, we estimate that the potential value from data in the sector could be more than $300 billion in value every year, two-thirds of which would be in the form of reducing national health care expenditures by about 8 percent. In the private sector, we estimate, for example, that a retailer using big data to the full has the potential to increase its operating margin by more than 60 percent. In the developed economies of Europe, we estimate that government administration could save more than €100 billion ($149 billion) in operational efficiency improvements alone by using big data. This estimate does not include big data levers that could reduce fraud, errors, and tax gaps (i.e., the gap between potential and actual tax revenue).

Digital data are now everywhere—in every sector, in every economy, in every organization and user of digital technology. While this topic might once have concerned only a few data geeks, big data is now relevant for leaders across every sector, and consumers of products and services stand to benefit from its application. The ability to store, aggregate, and combine data and then use the results to perform deep analyses has become ever more accessible as trends such as Moore's Law in computing, its equivalent in digital storage, and cloud computing continue to lower costs and other technology barriers.[3] For less than $600, an individual can purchase a disk drive with the capacity to store all of the world's music.[4] The means to extract insight from data are also markedly improving as software available to apply increasingly sophisticated techniques combines with growing computing horsepower. Further, the ability to generate, communicate, share, and access data has been revolutionized by the increasing number of people, devices, and sensors that are now

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3   Moore's Law, first described by Intel cofounder Gordon Moore, states that the number of transistors that can be placed on an integrated circuit doubles approximately every two years. In other words, the amount of computing power that can be purchased for the same amount of money doubles about every two years. Cloud computing refers to the ability to access highly scalable computing resources through the Internet, often at lower prices than those required to install on one's own computers because the resources are shared across many users.

4   Kevin Kelly, Web 2.0 Expo and Conference, March 29, 2011. Video available at: www.web2expo.com/webexsf2011/public/schedule/proceedings

connected by digital networks. In 2010, more than 4 billion people, or 60 percent of the world's population, were using mobile phones, and about 12 percent of those people had smartphones, whose penetration is growing at more than 20 percent a year. More than 30 million networked sensor nodes are now present in the transportation, automotive, industrial, utilities, and retail sectors. The number of these sensors is increasing at a rate of more than 30 percent a year.

There are many ways that big data can be used to create value across sectors of the global economy. Indeed, our research suggests that we are on the cusp of a tremendous wave of innovation, productivity, and growth, as well as new modes of competition and value capture—all driven by big data as consumers, companies, and economic sectors exploit its potential. But why should this be the case now? Haven't data always been part of the impact of information and communication technology? Yes, but our research suggests that the scale and scope of changes that big data are bringing about are at an inflection point, set to expand greatly, as a series of technology trends accelerate and converge. We are already seeing visible changes in the economic landscape as a result of this convergence.

Many pioneering companies are already using big data to create value, and others need to explore how they can do the same if they are to compete. Governments, too, have a significant opportunity to boost their efficiency and the value for money they offer citizens at a time when public finances are constrained—and are likely to remain so due to aging populations in many countries around the world. Our research suggests that the public sector can boost its productivity significantly through the effective use of big data.

However, companies and other organizations and policy makers need to address considerable challenges if they are to capture the full potential of big data. A shortage of the analytical and managerial talent necessary to make the most of big data is a significant and pressing challenge and one that companies and policy makers can begin to address in the near term. The United States alone faces a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts to analyze big data and make decisions based on their findings. The shortage of talent is just the beginning. Other challenges we explore in this report include the need to ensure that the right infrastructure is in place and that incentives and competition are in place to encourage continued innovation; that the economic benefits to users, organizations, and the economy are properly understood; and that safeguards are in place to address public concerns about big data.

This report seeks to understand the state of digital data, how different domains can use large data sets to create value, the potential value across stakeholders, and the implications for the leaders of private sector companies and public sector organizations, as well as for policy makers. We have supplemented our analysis of big data as a whole with a detailed examination of five domains (health care in the United States, the public sector in Europe, retail in the United States, and manufacturing and personal location data globally). This research by no means represents the final word on big data; instead, we see it as a beginning. We fully anticipate that this is a story that will continue to evolve as technologies and techniques using big data develop and data, their uses, and their economic benefits grow (alongside associated challenges and risks). For now, however, our research yields seven key insights:

1. Data have swept into every industry and business function and are now an important factor of production

Several research teams have studied the total amount of data generated, stored, and consumed in the world. Although the scope of their estimates and therefore their results vary, all point to exponential growth in the years ahead.[5] MGI estimates that enterprises globally stored more than 7 exabytes of new data on disk drives in 2010, while consumers stored more than 6 exabytes of new data on devices such as PCs and notebooks. One exabyte of data is the equivalent of more than 4,000 times the information stored in the US Library of Congress.[6] Indeed, we are generating so much data today that it is physically impossible to store it all.[7] Health care providers, for instance, discard 90 percent of the data that they generate (e.g., almost all real-time video feeds created during surgery).

Big data has now reached every sector in the global economy. Like other essential factors of production such as hard assets and human capital, much of modern economic activity simply couldn't take place without it. We estimate that by 2009, nearly all sectors in the US economy had at least an average of 200 terabytes of stored data (twice the size of US retailer Wal-Mart's data warehouse in 1999) per company with more than 1,000 employees. Many sectors had more than 1 petabyte in mean stored data per company. In total, European organizations have about 70 percent of the storage capacity of the entire United States at almost 11 exabytes compared with more than 16 exabytes in 2010. Given that European economies are similar to each other in terms of their stage of development and thus their distribution of firms, we believe that the average company in most industries in Europe has enough capacity to store and manipulate big data. In contrast, the per capita data intensity in other regions is much lower. This suggests that, in the near term at least, the most potential to create value through the use of big data will be in the most developed economies. Looking ahead, however, there is huge potential to leverage big data in developing economies as long as the right conditions are in place. Consider, for instance, the fact that Asia is already the leading region for the generation of personal location data simply because so many mobile phones are in use there. More mobile phones—an estimated 800 million devices in 2010—are in use in China than in any other country. Further, some individual companies in developing regions could be far more advanced in their use of big data than averages might suggest. And some organizations will take advantage of the ability to store and process data remotely.

The possibilities of big data continue to evolve rapidly, driven by innovation in the underlying technologies, platforms, and analytic capabilities for handling data, as well as the evolution of behavior among its users as more and more individuals live digital lives.

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5   See Peter Lyman and Hal Varian, How much information? 2003, School of Information Management and Systems, University of California at Berkeley, 2003; papers from the IDC Digital Universe research project, sponsored by EMC, including *The expanding digital universe,* March 2007; *The diverse and exploding digital universe,* March 2008; *As the economy contracts, the digital universe expands,* May 2009, and *The digital universe decade—Are you ready?*, May 2010 (www.emc.com/leadership/programs/digital-universe.htm); two white papers from the University of California, San Diego, Global Information Industry Center: Roger Bohn and James Short, *How much information? 2009: Report on American consumers,* January 2010, and Roger Bohn, James Short, and Chaitanya Baru, *How much information? 2010: Report on enterprise server information,* January 2011; and Martin Hilbert and Priscila López, "The world's technological capacity to store, communicate, and compute information," *Science*, February 10, 2011.

6   According to the Library of Congress Web site, the US Library of Congress had 235 terabytes of storage in April 2011.

7   For another comparison of data generation versus storage, see John F. Gantz, David Reinsel, Christopher Chute, Wolfgang Schlichting, John McArthur, Stephen Minton, Irida Xheneti, Anna Toncheva, and Alex Manfrediz, "The expanding digital universe," IDC white paper, sponsored by EMC, March 2007.

2. Big data creates value in several ways

We have identified five broadly applicable ways to leverage big data that offer transformational potential to create value and have implications for how organizations will have to be designed, organized, and managed. For example, in a world in which large-scale experimentation is possible, how will corporate marketing functions and activities have to evolve? How will business processes change, and how will companies value and leverage their assets (particularly data assets)? Could a company's access to, and ability to analyze, data potentially confer more value than a brand? What existing business models are likely to be disrupted? For example, what happens to industries predicated on information asymmetry—e.g., various types of brokers—in a world of radical data transparency? How will incumbents tied to legacy business models and infrastructures compete with agile new attackers that are able to quickly process and take advantage of detailed consumer data that is rapidly becoming available, e.g., what they say in social media or what sensors report they are doing in the world? And what happens when surplus starts shifting from suppliers to customers, as they become empowered by their own access to data, e.g., comparisons of prices and quality across competitors?

Creating transparency

Simply making big data more easily accessible to relevant stakeholders in a timely manner can create tremendous value. In the public sector, for example, making relevant data more readily accessible across otherwise separated departments can sharply reduce search and processing time. In manufacturing, integrating data from R&D, engineering, and manufacturing units to enable concurrent engineering can significantly cut time to market and improve quality.

Enabling experimentation to discover needs, expose variability, and improve performance

As they create and store more transactional data in digital form, organizations can collect more accurate and detailed performance data (in real or near real time) on everything from product inventories to personnel sick days. IT enables organizations to instrument processes and then set up controlled experiments. Using data to analyze variability in performance—that which either occurs naturally or is generated by controlled experiments—and to understand its root causes can enable leaders to manage performance to higher levels.

Segmenting populations to customize actions

Big data allows organizations to create highly specific segmentations and to tailor products and services precisely to meet those needs. This approach is well known in marketing and risk management but can be revolutionary elsewhere—for example, in the public sector where an ethos of treating all citizens in the same way is commonplace. Even consumer goods and service companies that have used segmentation for many years are beginning to deploy ever more sophisticated big data techniques such as the real-time microsegmentation of customers to target promotions and advertising.

Replacing/supporting human decision making with automated algorithms

Sophisticated analytics can substantially improve decision making, minimize risks, and unearth valuable insights that would otherwise remain hidden. Such analytics have applications for organizations from tax agencies that can use automated risk engines to flag candidates for further examination to retailers that can use algorithms to optimize decision processes such as the automatic fine-tuning of inventories and pricing in response to real-time in-store and online sales. In some cases, decisions will not necessarily be automated but augmented by analyzing huge, entire data sets using big data techniques and technologies rather than just smaller samples that individuals with spreadsheets can handle and understand. Decision making may never be the same; some organizations are already making better decisions by analyzing entire data sets from customers, employees, or even sensors embedded in products.

Innovating new business models, products, and services

Big data enables companies to create new products and services, enhance existing ones, and invent entirely new business models. Manufacturers are using data obtained from the use of actual products to improve the development of the next generation of products and to create innovative after-sales service offerings. The emergence of real-time location data has created an entirely new set of location-based services from navigation to pricing property and casualty insurance based on where, and how, people drive their cars.

3. Use of big data will become a key basis of competition and growth for individual firms

The use of big data is becoming a key way for leading companies to outperform their peers. For example, we estimate that a retailer embracing big data has the potential to increase its operating margin by more than 60 percent. We have seen leading retailers such as the United Kingdom's Tesco use big data to capture market share from its local competitors, and many other examples abound in industries such as financial services and insurance. Across sectors, we expect to see value accruing to leading users of big data at the expense of laggards, a trend for which the emerging evidence is growing stronger.[8] Forward-thinking leaders can begin to aggressively build their organizations' big data capabilities. This effort will take time, but the impact of developing a superior capacity to take advantage of big data will confer enhanced competitive advantage over the long term and is therefore well worth the investment to create this capability. But the converse is also true. In a big data world, a competitor that fails to sufficiently develop its capabilities will be left behind.

Big data will also help to create new growth opportunities and entirely new categories of companies, such as those that aggregate and analyze industry data. Many of these will be companies that sit in the middle of large information flows where data about products and services, buyers and suppliers, and consumer preferences and intent can be captured and analyzed. Examples are likely to include companies that interface with large numbers of consumers buying a wide range of products and services, companies enabling global supply chains, companies that process millions of transactions, and those that provide platforms for consumer digital experiences. These will be the big-data-advantaged businesses. More businesses will find themselves with some kind of big data advantage than one might at first think. Many companies have access to valuable pools of data generated by their products and services. Networks will even

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8   Erik Brynjolfsson, Lorin M. Hitt, and Heekyung Hellen Kim, *Strength in numbers: How does data-driven decision-making affect firm performance?,* April 22, 2011, available at SSRN (ssrn. com/ abstract=1819486).

connect physical products, enabling those products to report their own serial numbers, ship dates, number of times used, and so on.

Some of these opportunities will generate new sources of value; others will cause major shifts in value within industries. For example, medical clinical information providers, which aggregate data and perform the analyses necessary to improve health care efficiency, could compete in a market worth more than $10 billion by 2020. Early movers that secure access to the data necessary to create value are likely to reap the most benefit (see Box 2, "How do we measure the value of big data?"). From the standpoint of competitiveness and the potential capture of value, all companies need to take big data seriously. In most industries, established competitors and new entrants alike will leverage data-driven strategies to innovate, compete, and capture value. Indeed, we found early examples of such use of data in every sector we examined.

Box 2. How do we measure the value of big data?

When we set out to size the potential of big data to create value, we considered only those actions that essentially depend on the use of big data—i.e., actions where the use of big data is necessary (but usually not sufficient) to execute a particular lever. We did not include the value of levers that consist only of automation but do not involve big data (e.g., productivity increases from replacing bank tellers with ATMs). Note also that we include the gross value of levers that require the use of big data. We did not attempt to estimate big data's relative contribution to the value generated by a particular lever but rather estimated the total value created.

4. The use of big data will underpin new waves of productivity growth and consumer surplus

Across the five domains we studied, we identified many big data levers that will, in our view, underpin substantial productivity growth (Exhibit 1). These opportunities have the potential to improve efficiency and effectiveness, enabling organizations both to do more with less and to produce higher-quality outputs, i.e., increase the value-added content of products and services.[9] For example, we found that companies can leverage data to design products that better match customer needs. Data can even be leveraged to improve products as they are used. An example is a mobile phone that has learned its owner's habits and preferences, that holds applications and data tailored to that particular user's needs, and that will therefore be more valuable than a new device that is not customized to a user's needs.[10] Capturing this potential requires innovation in operations and processes. Examples include augmenting decision making—from clinical practice to tax audits—with algorithms as well as making innovations in products and services, such as accelerating the development of new drugs by using advanced analytics and creating new, proactive after-sales maintenance service for automobiles through the use of networked sensors. Policy makers who understand that accelerating productivity within sectors is the key lever for increasing the standard of living in their economies as a whole need to ease the way for organizations to take advantage of big data levers that enhance productivity.

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9   Note that the effectiveness improvement is not captured in some of the productivity calculations because of a lack of precision in some metrics such as improved health outcomes or better matching the needs of consumers with goods in retail services. Thus, in many cases, our productivity estimates are likely to be conservative.

10   Hal Varian has described the ability of products to leverage data to improve with use as "product kaizen." See Hal Varian, *Computer mediated transactions,* 2010 Ely Lecture at the American Economics Association meeting, Atlanta, Georgia

We also find a general pattern in which customers, consumers, and citizens capture a large amount of the economic surplus that big data enables—they are both direct and indirect beneficiaries of big-data-related innovation.[11] For example, the use of big data can enable improved health outcomes, higher-quality civic engagement with government, lower prices due to price transparency, and a better match between products and consumer needs. We expect this trend toward enhanced consumer surplus to continue and accelerate across all sectors as they deploy big data. Take the area of personal location data as illustration. In this area, the use of real-time traffic information to inform navigation will create a quantifiable consumer surplus through savings on the time spent traveling and on fuel consumption. Mobile location-enabled applications will create surplus from consumers, too. In both cases, the surplus these innovations create is likely to far exceed the revenue generated by service providers. For consumers to benefit, policy makers will often need to push the deployment of big data innovations.

Exhibit 1

Big data can generate significant financial value across sectors

US health care
- $300 billion value per year
- ~0.7 percent annual productivity growth

Europe public sector administration
- €250 billion value per year
- ~0.5 percent annual productivity growth

Global personal location data
- $100 billion+ revenue for service providers
- Up to $700 billion value to end users

US retail
- 60+% increase in net margin possible
- 0.5–1.0 percent annual productivity growth

Manufacturing
- Up to 50 percent decrease in product development, assembly costs
- Up to 7 percent reduction in working capital

SOURCE: McKinsey Global Institute analysis

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11   Professor Erik Brynjolfsson of the Massachusetts Institute of Technology has noted that the creation of large amounts of consumer surplus, not captured in traditional economic metrics such as GDP, is a characteristic of the deployment of IT.

5. While the use of big data will matter across sectors, some sectors are poised for greater gains

Illustrating differences among different sectors, if we compare the historical productivity of sectors in the United States with the potential of these sectors to capture value from big data (using an index that combines several quantitative metrics), we observe that patterns vary from sector to sector (Exhibit 2).[12]

Exhibit 2

Some sectors are positioned for greater gains from the use of big data

Historical productivity growth in the United States, 2000–08
%

	Cluster A		Cluster D
Cluster B		Cluster E
Cluster C		

Bubble sizes denote relative sizes of GDP

Computer and electronic products
Information
Administration, support, and waste management
Wholesale trade
Manufacturing
Transportation and warehousing
Finance and insurance
Professional services
Real estate and rental
Utilities
Health care providers
Retail trade
Government
Accommodation and food
Natural resources
Arts and entertainment
Management of companies
Other services
Educational services
Construction

Low ← **Big data value potential index**[1] → High

1 See appendix for detailed definitions and metrics used for value potential index.
SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

Computer and electronic products and information sectors (Cluster A), traded globally, stand out as sectors that have already been experiencing very strong productivity growth and that are poised to gain substantially from the use of big data. Two services sectors (Cluster B)—finance and insurance and government—are positioned to benefit very strongly from big data as long as barriers to its use can be overcome. Several sectors (Cluster C) have experienced negative productivity growth, probably indicating that these sectors face strong systemic barriers to increasing productivity. Among the remaining sectors, we see that globally traded sectors (mostly Cluster D) tend to have experienced higher historical productivity growth, while local services (mainly Cluster E) have experienced lower growth.

While all sectors will have to overcome barriers to capture value from the use of big data, barriers are structurally higher for some than for others (Exhibit 3). For example, the public sector, including education, faces higher hurdles because of a lack of data-driven mind-set and available data. Capturing value in health care faces challenges given the relatively low IT investment performed so far. Sectors such as retail,

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12 The index consists of five metrics that are designed as proxies to indicate (1) the amount of data available for use and analysis; (2) variability in performance; (3) number of stakeholders (customers and suppliers) with which an organization deals on average; (4) transaction intensity; and (5) turbulence inherent in a sector. We believe that these are the characteristics that make a sector more or less likely to take advantage of the five transformative big data opportunities. See the appendix for further details.

manufacturing, and professional services may have relatively lower degrees of barriers to overcome for precisely the opposite reasons.

Exhibit 3

A heat map shows the relative ease of capturing the value potential across sectors

Legend:
- Top quintile (easiest to capture)
- 2nd quintile
- 3rd quintile
- 4th quintile
- Bottom quintile (most difficult) to capture)
- No data available

Categories	Sectors	Overall ease of capture index[1]	Talent	IT intensity	Data-driven mind-set	Data availability
Goods	Manufacturing					
Goods	Construction					
Goods	Natural resources					
Goods	Computer and electronic products					
Goods	Real estate, rental, and leasing					
Goods	Wholesale trade					
Goods	Information					
Services	Transportation and warehousing					
Services	Retail trade					
Services	Administrative, support, waste management, and remediation services					
Services	Accommodation and food services					
Services	Other services (except public administration)					
Services	Arts, entertainment, and recreation					
Services	Finance and Insurance					
Services	Professional, scientific, and technical services					
Services	Management of companies and enterprises					
Regulated and public	Government					
Regulated and public	Educational services					
Regulated and public	Health care and social assistance					
Regulated and public	Utilities					

1 See appendix for detailed definitions and metrics used for each of the criteria.
SOURCE: McKinsey Global Institute analysis

6. There will be a shortage of talent necessary for organizations to take advantage of big data

A significant constraint on realizing value from big data will be a shortage of talent, particularly of people with deep expertise in statistics and machine learning, and the managers and analysts who know how to operate companies by using insights from big data.

In the United States, we expect big data to rapidly become a key determinant of competition across sectors. But we project that demand for deep analytical positions in a big data world could exceed the supply being produced on current trends by 140,000 to 190,000 positions (Exhibit 4). Furthermore, this type of talent is difficult to produce, taking years of training in the case of someone with intrinsic mathematical abilities. Although our quantitative analysis uses the United States as illustration, we believe that the constraint on this type of talent will be global, with the caveat that some regions may be able to produce the supply that can fill talent gaps in other regions.

In addition, we project a need for 1.5 million additional managers and analysts in the United States who can ask the right questions and consume the results of the analysis of big data effectively. The United States—and other economies facing similar shortages— cannot fill this gap simply by changing graduate requirements and waiting for people

to graduate with more skills or by importing talent (although these could be important actions to take). It will be necessary to retrain a significant amount of the talent in place; fortunately, this level of training does not require years of dedicated study.

Exhibit 4

Demand for deep analytical talent in the United States could be 50 to 60 percent greater than its projected supply by 2018

Supply and demand of deep analytical talent by 2018
Thousand people
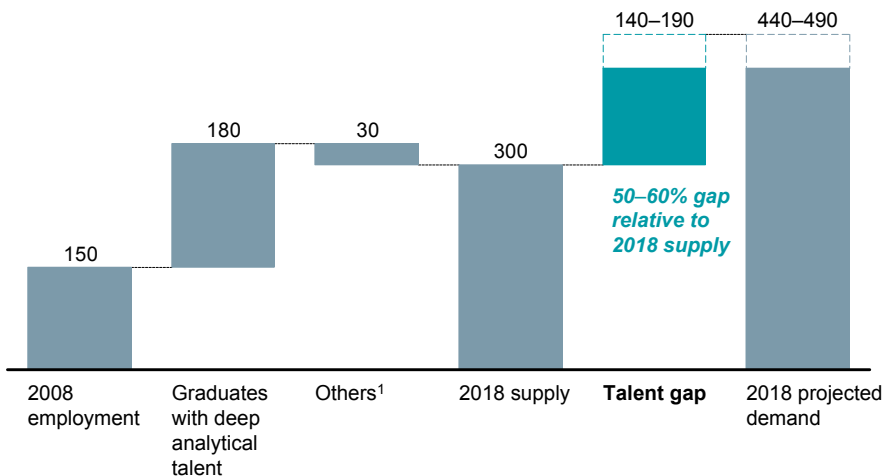
1 Other supply drivers include attrition (-), immigration (+), and reemploying previously unemployed deep analytical talent (+).
SOURCE: US Bureau of Labor Statistics; US Census; Dun & Bradstreet; company interviews; McKinsey Global Institute analysis

7. Several issues will have to be addressed to capture the full potential of big data

Data policies. As an ever larger amount of data is digitized and travels across organizational boundaries, there is a set of policy issues that will become increasingly important, including, but not limited to, privacy, security, intellectual property, and liability. Clearly, privacy is an issue whose importance, particularly to consumers, is growing as the value of big data becomes more apparent. Personal data such as health and financial records are often those that can offer the most significant human benefits, such as helping to pinpoint the right medical treatment or the most appropriate financial product. However, consumers also view these categories of data as being the most sensitive. It is clear that individuals and the societies in which they live will have to grapple with trade-offs between privacy and utility.

Another closely related concern is data security, e.g., how to protect competitively sensitive data or other data that should be kept private. Recent examples have demonstrated that data breaches can expose not only personal consumer information and confidential corporate information but even national security secrets. With serious breaches on the rise, addressing data security through technological and policy tools will become essential.[13]

Big data's increasing economic importance also raises a number of legal issues, especially when coupled with the fact that data are fundamentally different from many

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13 Data privacy and security are being studied and debated at great length elsewhere, so we have not made these topics the focus of the research reported here.

other assets. Data can be copied perfectly and easily combined with other data. The same piece of data can be used simultaneously by more than one person. All of these are unique characteristics of data compared with physical assets. Questions about the intellectual property rights attached to data will have to be answered: Who "owns" a piece of data and what rights come attached with a dataset? What defines "fair use" of data? There are also questions related to liability: Who is responsible when an inaccurate piece of data leads to negative consequences? Such types of legal issues will need clarification, probably over time, to capture the full potential of big data.

Technology and techniques. To capture value from big data, organizations will have to deploy new technologies (e.g., storage, computing, and analytical software) and techniques (i.e., new types of analyses). The range of technology challenges and the priorities set for tackling them will differ depending on the data maturity of the institution. Legacy systems and incompatible standards and formats too often prevent the integration of data and the more sophisticated analytics that create value from big data. New problems and growing computing power will spur the development of new analytical techniques. There is also a need for ongoing innovation in technologies and techniques that will help individuals and organizations to integrate, analyze, visualize, and consume the growing torrent of big data.

Organizational change and talent. Organizational leaders often lack the understanding of the value in big data as well as how to unlock this value. In competitive sectors this may prove to be an Achilles heel for some companies since their established competitors as well as new entrants are likely to leverage big data to compete against them. And, as we have discussed, many organizations do not have the talent in place to derive insights from big data. In addition, many organizations today do not structure workflows and incentives in ways that optimize the use of big data to make better decisions and take more informed action.

Access to data. To enable transformative opportunities, companies will increasingly need to integrate information from multiple data sources. In some cases, organizations will be able to purchase access to the data. In other cases, however, gaining access to third-party data is often not straightforward. The sources of third-party data might not have considered sharing it. Sometimes, economic incentives are not aligned to encourage stakeholders to share data. A stakeholder that holds a certain dataset might consider it to be the source of a key competitive advantage and thus would be reluctant to share it with other stakeholders. Other stakeholders must find ways to offer compelling value propositions to holders of valuable data.

Industry structure. Sectors with a relative lack of competitive intensity and performance transparency, along with industries where profit pools are highly concentrated, are likely to be slow to fully leverage the benefits of big data. For example, in the public sector, there tends to be a lack of competitive pressure that limits efficiency and productivity; as a result, the sector faces more difficult barriers than other sectors in the way of capturing the potential value from using big data. US health care is another example of how the structure of an industry impacts on how easy it will be to extract value from big data. This is a sector that not only has a lack of performance transparency into cost and quality but also an industry structure in which payors will gain (from fewer payouts for unnecessary treatment) from the use of clinical data. However, the gains accruing to payors will be at the expense of the providers (fewer medical activities to charge for) from whom the payors would have to obtain the clinical data. As these examples suggest, organization leaders and policy makers will have to consider how industry structures could evolve in a big data world if they are to determine how to optimize value creation at the level of individual firms, sectors, and economies as a whole.

□   □   □

The effective use of big data has the potential to transform economies, delivering a new wave of productivity growth and consumer surplus. Using big data will become a key basis of competition for existing companies, and will create new competitors who are able to attract employees that have the critical skills for a big data world. Leaders of organizations need to recognize the potential opportunity as well as the strategic threats that big data represent and should assess and then close any gap between their current IT capabilities and their data strategy and what is necessary to capture big data opportunities relevant to their enterprise. They will need to be creative and proactive in determining which pools of data they can combine to create value and how to gain access to those pools, as well as addressing security and privacy issues. On the topic of privacy and security, part of the task could include helping consumers to understand what benefits the use of big data offers, along with the risks. In parallel, companies need to recruit and retain deep analytical talent and retrain their analyst and management ranks to become more data savvy, establishing a culture that values and rewards the use of big data in decision making.

Policy makers need to recognize the potential of harnessing big data to unleash the next wave of growth in their economies. They need to provide the institutional framework to allow companies to easily create value out of data while protecting the privacy of citizens and providing data security. They also have a significant role to play in helping to mitigate the shortage of talent through education and immigration policy and putting in place technology enablers including infrastructure such as communication networks; accelerating research in selected areas including advanced analytics; and creating an intellectual property framework that encourages innovation. Creative solutions to align incentives may also be necessary, including, for instance, requirements to share certain data to promote the public welfare.

Are you ready for the era of "big data"?

Radical customization, constant experimentation, and novel business models will be new hallmarks of competition as companies capture and analyze huge volumes of data. Here's what you should know.

Brad Brown, Dr. Michael Chui, and Dr. James Manyika

The top marketing executive at a sizable US retailer recently found herself perplexed by the sales reports she was getting. A major competitor was steadily gaining market share across a range of profitable segments. Despite a counterpunch that combined online promotions with merchandizing improvements, her company kept losing ground.

When the executive convened a group of senior leaders to dig into the competitor's practices, they found that the challenge ran deeper than they had imagined. The competitor had made massive investments in its ability to collect, integrate, and analyze data from each store and every sales unit and had used this ability to run myriad real-world experiments. At the same time, it had linked this information to suppliers' databases, making it possible to adjust prices in real time, to reorder hot-selling items automatically, and to shift items from store to store easily. By constantly testing, bundling, synthesizing, and making information instantly available across the organization—from the store floor to the CFO's office—the rival company had become a different, far nimbler type of business.

What this executive team had witnessed first hand was the game-changing effects of big data. Of course, data characterized the information age from the start. It underpins processes that manage employees; it helps to track purchases and sales; and it offers clues about how customers will behave.

But over the last few years, the volume of data has exploded. In 15 of the US economy's 17 sectors, companies with more than 1,000 employees store, on average, over 235 terabytes of data—more data than is contained in the US Library of Congress. Reams of data still flow from financial transactions and customer interactions but also cascade in at unparalleled rates from new devices and multiple points along the value chain. Just think about what could be happening at your own company right now: sensors embedded in process machinery may be collecting operations data, while marketers scan social media or use location data from smartphones to understand teens' buying quirks. Data

exchanges may be networking your supply chain partners, and employees could be swapping best practices on corporate wikis.

All of this new information is laden with implications for leaders and their enterprises.[1] Emerging academic research suggests that companies that use data and business analytics to guide decision making are more productive and experience higher returns on equity than competitors that don't.[2] That's consistent with research we've conducted showing that "networked organizations" can gain an edge by opening information conduits internally and by engaging customers and suppliers strategically through Web-based exchanges of information.[3]

Over time, we believe big data may well become a new type of corporate asset that will cut across business units and function much as a powerful brand does, representing a key basis for competition. If that's right, companies need to start thinking in earnest about whether they are organized to exploit big data's potential and to manage the threats it can pose. Success will demand not only new skills but also new perspectives on how the era of big data could evolve—the widening circle of management practices it may affect and the foundation it represents for new, potentially disruptive business models.

Five big questions about big data

In the remainder of this article, we outline important ways big data could change competition: by transforming processes, altering corporate ecosystems, and facilitating innovation. We've organized the discussion around five questions we think all senior executives should be asking themselves today.

At the outset, we'll acknowledge that these are still early days for big data, which is evolving as a business concept in tandem with the underlying technologies. Nonetheless, we can identify big data's key elements. First, companies can now collect data across business units and, increasingly, even from partners and customers (some of this is truly big, some more granular and complex). Second, a flexible infrastructure can integrate information and scale up effectively to meet the surge. Finally, experiments, algorithms, and analytics can make sense of all this information. We also can identify organizations that are making data a core element of strategy. In the discussion that follows and elsewhere in this issue, we have assembled case studies of early movers in the big data realm (see 'Seizing the potential of "big data"' and the accompanying sidebar, 'AstraZeneca's "big data" partnership,' page 115).

In addition, we'd suggest that executives look to history for clues about what's coming next. Earlier waves of technology adoption, for example, show that productivity surges not only because companies adopt new technologies but also, more critically, because they can adapt their management practices and change their organizations to maximize the potential. We examined the possible impact of big data across a number of industries and found that while it will be important in every sector and function, some industries will realize benefits sooner because they are more ready to capitalize

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1   For more, see the McKinsey Global Institute report "Big data: The next frontier for innovation, competition, and productivity," available free of charge online at mckinsey.com/mgi.

2   See Erik Brynjolfsson, Lorin M. Hitt, and Heekyung Hellen Kim, "Strength in numbers: How does data-driven decisionmaking affect firm performance?," Social Science Research Network (SSRN), April 2011. In this study, the authors found that effective use of data and analytics correlated with a 5 to 6 percent improvement in productivity, as well as higher profitability and market value. For more, see the forthcoming e-book by Brynjolfsson and coauthor Andrew McAfee, "Race Against the Machine: How the digital revolution accelerates innovation, drives productivity, and irreversibly transforms employment and the economy" (Digital Frontier Press, October 2011).

3   Jacques Bughin and Michael Chui, "The rise of the networked enterprise: Web 2.0 finds its payday," *The McKinsey Quarterly,* December 2010.

on data or have strong market incentives to do so (see sidebar, "Parsing the benefits: Not all industries are created equal").

The era of big data also could yield new management principles. In the early days of professionalized corporate management, leaders discovered that minimum efficient scale was a key determinant of competitive success. Likewise, future competitive benefits may accrue to companies that can not only capture more and better data but also use that data effectively at scale. We hope that by reflecting on such issues and the five questions that follow, executives will be better able to recognize how big data could upend assumptions behind their strategies, as well as the speed and scope of the change that's now under way.

1. What happens in a world of radical transparency, with data widely available?

As information becomes more readily accessible across sectors, it can threaten companies that have relied on proprietary data as a competitive asset. The real-estate industry, for example, trades on information asymmetries such as privileged access to transaction data and tightly held knowledge of the bid and ask behavior of buyers. Both require significant expense and effort to acquire. In recent years, however, online specialists in real-estate data and analytics have started to bypass agents, permitting buyers and sellers to exchange perspectives on the value of properties and creating parallel sources for real-estate data.

Beyond real estate, cost and pricing data are becoming more accessible across a spectrum of industries. Another swipe at proprietary information is the assembly by some companies of readily available satellite imagery that, when processed and analyzed, contains clues about competitors' physical facilities. These satellite sleuths glean insights into expansion plans or business constraints as revealed by facility capacity, shipping movements, and the like.

One big challenge is the fact that the mountains of data many companies are amassing often lurk in departmental "silos," such as R&D, engineering, manufacturing, or service operations—impeding timely exploitation. Information hoarding within business units also can be a problem: many financial institutions, for example, suffer from their own failure to share data among diverse lines of business, such as financial markets, money management, and lending. Often, that prevents these companies from forming a coherent view of individual customers or understanding links among financial markets.

Some manufacturers are attempting to pry open these departmental enclaves: they are integrating data from multiple systems, inviting collaboration among formerly walled-off functional units, and even seeking information from external suppliers and customers to cocreate products. In advanced-manufacturing sectors such as automotive, for example, suppliers from around the world make thousands of components. More integrated data platforms now allow companies and their supply chain partners to collaborate during the design phase—a crucial determinant of final manufacturing costs.

Box 1. Parsing the benefits: Not all industries are created equal

Even as big data changes the game for virtually every sector, it also tilts the playing field, favoring some companies and industries, particularly in the early stages of adoption. To understand those dynamics, we examined 20 sectors in the US economy, sized their contributions to GDP, and developed two indexes that estimate each sector's potential for value creation using big data, as well as the ease of capturing that value.[1]

As the accompanying sector map shows (Exhibit 1), financial players get the highest marks for value creation opportunities. Many of these companies have invested deeply in IT and have large data pools to exploit. Information industries, not surprisingly, are also in this league. They are data intensive by nature, and they use that data innovatively to compete by adopting sophisticated analytic techniques.

Exhibit 1

The ease of capturing big data's value, and the magnitude of its potential, vary across sectors
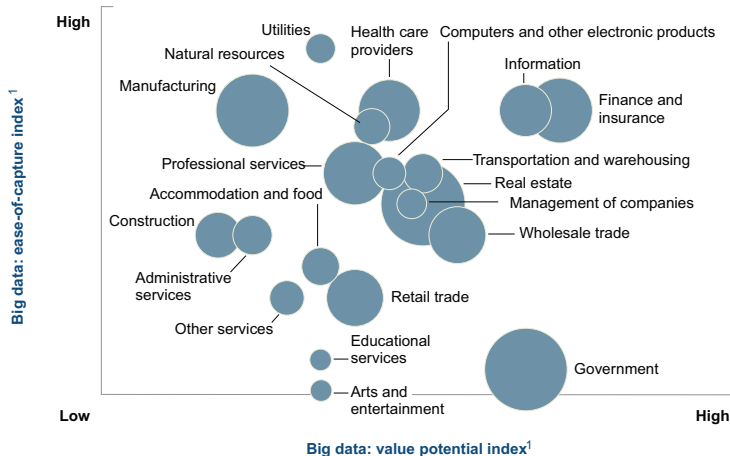
1 For detailed explication of metrics, see appendix in McKinsey Global Institute full report Big data: The next frontier for innovation, competition, and productivity, available free of charge online at mckinsey.com/mgi

SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

The public sector is the most fertile terrain for change. Governments collect huge amounts of data, transact business with millions of citizens, and, more often than not, suffer from highly variable performance. While potential benefits are large, governments face steep barriers to making use of this trove: few managers are pushed to exploit the data they have, and government departments often keep data in siloes.

Fragmented industry structures complicate the value creation potential of sectors such as health care, manufacturing, and retailing. The average company in them is relatively small and can access only limited amounts of data. Larger players, however, usually swim in bigger pools of data, which they can more readily use to create value.

1   The big data value potential index takes into account a sector's competitive conditions, such as market turbulence and performance variability; structural factors, such as transaction intensity and the number of potential customers and business partners; and the quantity of data available. The ease-of-capture index takes stock of the number of employees with deep analytical talent in an industry, baseline investments in IT, the accessibility of data sources, and the degree to which managers make data-driven decisions.

> **Box 1. Parsing the benefits: Not all industries are created equal (continued)**
>
> The US health care sector, for example, is dotted by many small companies and individual physicians' practices. Large hospital chains, national insurers, and drug manufacturers, by contrast, stand to gain substantially through the pooling and more effective analysis of data. We expect this trend to intensify with changing regulatory and market conditions. In manufacturing, too, larger companies with access to much internal and market data will be able to mine new reservoirs of value. Smaller players are likely to benefit only if they discover innovative ways to share data or grow through industry consolidation. The same goes for retailing, where—despite a healthy strata of data-rich chains and big-box stores on the cutting edge of big data—most players are smaller, local businesses with a limited ability to gather and analyze information.
>
> A final note: this analysis is a snapshot in time for one large country. As companies and organizations sharpen their data skills, even low-ranking sectors (by our gauges of value potential and data capture), such as construction and education, could see their fortunes change.

2. If you could test all of your decisions, how would that change the way you compete?

Big data ushers in the possibility of a fundamentally different type of decision making. Using controlled experiments, companies can test hypotheses and analyze results to guide investment decisions and operational changes. In effect, experimentation can help managers distinguish causation from mere correlation, thus reducing the variability of outcomes while improving financial and product performance.

Robust experimentation can take many forms. Leading online companies, for example, are continuous testers. In some cases, they allocate a set portion of their Web page views to conduct experiments that reveal what factors drive higher user engagement or promote sales. Companies selling physical goods also use experiments to aid decisions, but big data can push this approach to a new level. McDonald's, for example, has equipped some stores with devices that gather operational data as they track customer interactions, traffic in stores, and ordering patterns. Researchers can model the impact of variations in menus, restaurant designs, and training, among other things, on productivity and sales.

Where such controlled experiments aren't feasible, companies can use "natural" experiments to identify the sources of variability in performance. One government organization, for instance, collected data on multiple groups of employees doing similar work at different sites. Simply making the data available spurred lagging workers to improve their performance.

Leading retailers, meanwhile, are monitoring the in-store movements of customers, as well as how they interact with products. These retailers combine such rich data feeds with transaction records and conduct experiments to guide choices about which products to carry, where to place them, and how and when to adjust prices. Methods such as these helped one leading retailer to reduce the number of items it stocked by 17 percent, while raising the mix of higher-margin private-label goods—with no loss of market share.

3. How would your business change if you used big data for widespread, real-time customization?

Customer-facing companies have long used data to segment and target customers. Big data permits a major step beyond what until recently was considered state of the art, by making real-time personalization possible. A next-generation retailer will be able to track the behavior of individual customers from Internet click streams, update their preferences, and model their likely behavior in real time. They will then be able to recognize when customers are nearing a purchase decision and nudge the transaction to completion by bundling preferred products, offered with reward program savings. This real-time targeting, which would also leverage data from the retailer's multitier membership rewards program, will increase purchases of higher-margin products by its most valuable customers.

Retailing is an obvious place for data-driven customization because the volume and quality of data available from Internet purchases, social-network conversations, and, more recently, location-specific smartphone interactions have mushroomed. But other sectors, too, can benefit from new applications of data, along with the growing sophistication of analytical tools for dividing customers into more revealing microsegments.

One personal-line insurer, for example, tailors insurance policies for each customer, using fine-grained, constantly updated profiles of customer risk, changes in wealth, home asset value, and other data inputs. Utilities that harvest and analyze data on customer segments can markedly change patterns of power usage. Finally, HR departments that more finely segment employees by task and performance are beginning to change work conditions and implement incentives that improve both satisfaction and productivity.[4]

4. How can big data augment or even replace management?

Big data expands the operational space for algorithms and machine-mediated analysis. At some manufacturers, for example, algorithms analyze sensor data from production lines, creating self-regulating processes that cut waste, avoid costly (and sometimes dangerous) human interventions, and ultimately lift output. In advanced, "digital" oil fields, instruments constantly read data on wellhead conditions, pipelines, and mechanical systems. That information is analyzed by clusters of computers, which feed their results to real-time operations centers that adjust oil flows to optimize production and minimize downtimes. One major oil company has cut operating and staffing costs by 10 to 25 percent while increasing production by 5 percent.

Products ranging from copiers to jet engines can now generate data streams that track their usage. Manufacturers can analyze the incoming data and, in some cases, automatically remedy software glitches or dispatch service representatives for repairs. Some enterprise computer hardware vendors are gathering and analyzing such data to schedule preemptive repairs before failures disrupt customers' operations. The data can also be used to implement product changes that prevent future problems or to provide customer use inputs that inform next-generation offerings.

Some retailers are also at the forefront of using automated big data analysis: they use "sentiment analysis" techniques to mine the huge streams of data now generated by consumers using various types of social media, gauge responses to new marketing

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4   Nora Gardner, Devin McGranahan, and William Wolf, "Question for your HR chief: Are we using our 'people data to create value?'" *The McKinsey Quarterly,* March 2011.

campaigns in real time, and adjust strategies accordingly. Sometimes these methods cut weeks from the normal feedback and modification cycle.

But retailers aren't alone. One global beverage company integrates daily weather forecast data from an outside partner into its demand and inventory-planning processes. By analyzing three data points—temperatures, rainfall levels, and the number of hours of sunshine on a given day—the company cut its inventory levels while improving its forecasting accuracy by about 5 percent in a key European market.

The bottom line is improved performance, better risk management, and the ability to unearth insights that would otherwise remain hidden. As the price of sensors, communications devices, and analytic software continues to fall, more and more companies will be joining this managerial revolution.

5. Could you create a new business model based on data?

Big data is spawning new categories of companies that embrace information-driven business models. Many of these businesses play intermediary roles in value chains where they find themselves generating valuable "exhaust data" produced by business transactions. One transport company, for example, recognized that in the course of doing business, it was collecting vast amounts of information on global product shipments. Sensing opportunity, it created a unit that sells the data to supplement business and economic forecasts.

Another global company learned so much from analyzing its own data as part of a manufacturing turnaround that it decided to create a business to do similar work for other firms. Now the company aggregates shop floor and supply chain data for a number of manufacturing customers and sells software tools to improve their performance. This service business now outperforms the company's manufacturing one.

Big data also is turbocharging the ranks of data aggregators, which combine and analyze information from multiple sources to generate insights for clients. In health care, for example, a number of new entrants are integrating clinical, payment, public-health, and behavioral data to develop more robust illness profiles that help clients manage costs and improve treatments.

And with pricing data proliferating on the Web and elsewhere, entrepreneurs are offering price comparison services that automatically compile information across millions of products. Such comparisons can be a disruptive force from a retailer's perspective but have created substantial value for consumers. Studies show that those who use the services save an average of 10 percent—a sizable shift in value.

Confronting complications

Up to this point, we have emphasized the strategic opportunities big data presents, but leaders must also consider a set of complications. Talent is one of them. In the United States alone, our research shows, the demand for people with the deep analytical skills in big data (including machine learning and advanced statistical analysis) could outstrip current projections of supply by 50 to 60 percent. By 2018, as many as 140,000 to 190,000 additional specialists may be required. Also needed: an additional 1.5 million managers and analysts with a sharp understanding of how big data can be applied. Companies must step up their recruitment and retention programs, while making substantial investments in the education and training of key data personnel.

The greater access to personal information that big data often demands will place a spotlight on another tension, between privacy and convenience. Our research, for example, shows that consumers capture a large part of the economic surplus that big data generates: lower prices, a better alignment of products with consumer needs, and lifestyle improvements that range from better health to more fluid social interactions.[5] As a larger amount of data on the buying preferences, health, and finances of individuals is collected, however, privacy concerns will grow.

That's true for data security as well. The trends we've described often go hand in hand with more open access to information, new devices for gathering it, and cloud computing to support big data's weighty storage and analytical needs. The implication is that IT architectures will become more integrated and outward facing and will pose greater risks to data security and intellectual property. For some ideas on how leaders should respond, see "Meeting the cybersecurity challenge," on McKinseyquarterley.com.

□   □   □

Although corporate leaders will focus most of their attention on big data's implications for their own organizations, the mosaic of company-level opportunities we have surveyed also has broader economic implications. In health care, government services, retailing, and manufacturing, our research suggests, big data could improve productivity by 0.5 to 1 percent annually. In these sectors globally, it could produce hundreds of billions of dollars and euros in new value.

In fact, big data may ultimately be a key factor in how nations, not just companies, compete and prosper. Certainly, these techniques offer glimmers of hope to a global economy struggling to find a path toward more rapid growth. Through investments and forward-looking policies, company leaders and their counterparts in government can capitalize on big data instead of being blindsided by it.

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5   Jacques Bughin, "The Web's €100 billion surplus," *The McKinsey Quarterly,* January 2011.

Seizing the potential of "big data"

Companies are learning to use large-scale data gathering and analytics to shape strategy. Their experiences highlight the principles—and potential—of big data.

Dr. Jacques Bughin, John Livingston, and Sam Marwaha

Large-scale data gathering and analytics are quickly becoming a new frontier of competitive differentiation. While the moves of companies such as Amazon.com, Google, and Netflix grab the headlines in this space, other companies are quietly making progress.

In fact, companies in industries ranging from pharmaceuticals to retailing to telecommunications to insurance have begun moving forward with big data strategies in recent months. Together, the activities of those companies illustrate novel strategic approaches to big data and shed light on the challenges CEOs and other senior executives face as they work to shatter the organizational inertia that can prevent big data initiatives from taking root. From these experiences, we have distilled four principles that we hope will help CEOs and other corporate leaders as they try to seize the potential of big data.

1. Size the opportunities and threats

Many big data strategies arise when executives feel an urgent need to respond to a threat or see a chance to attack and disrupt an industry's value pools. At AstraZeneca, for example, executives recognized the power that real-world data (such as medical claims) gave the pharmaceutical company's customers in evaluating the cost effectiveness of its products (see Box 1, "AstraZeneca's 'big data' partnership").

In the case of a retailer we studied, big data was part of a difficult battle for market share. The company's strategy had long been predicated on matching the moves of an efficient big-box rival, yet now a different online player was draining the retailer's revenues and denting its margins. At the heart of the threat was the competitor's ability to gather and analyze consumer sentiment and generate recommendations across millions of customers—a capability that was neutralizing the retailer's sales force. Meanwhile, the competitor was becoming a platform where vendors could sell excess inventory by using publicly available price data aggregated across the industry to help pinpoint the size of discounts the vendors could offer to customers. The retailer's board asked whether it could leverage its own information resources to counter these challenges.

Box 1: AstraZeneca's "big data" partnership

Mark Lelinski, an executive at the global drugmaker, explains how the company is using data to build customer relationships that focus on the total cost of care.

We have always designed and manufactured our products with the mind-set of "make it effective, make it safe, and make sure it meets regulatory approval." Historically, at the early prelaunch stage, we were not thinking about the willingness of payers to pay for it—whether that's a patient, health plan, pharmacy benefit manager, employer, or the government. We weren't asking, "How do customers perceive our products relative to alternatives?"

But willingness to pay has obviously become extremely important in recent years—to the extent that more and more of our customers began complementing our clinical-trials data with their own proprietary data to conduct comparative-effectiveness studies. They were asking, "In a realworld setting, product X performs at this level and costs me this much. And product Y performs at this level and costs me this much. How do they compare?" Eventually, this practice created an imbalance in our payer conversations, as the dialogue became more transactional—more about unit cost and more about the data that our customers were bringing to the table. And from our perspective, few of the comparative studies that payers were conducting focused on health outcomes. So we decided that we needed to get beyond our single focus on the controlled environment of the randomized clinical trial and see the business from the other side as well.

The focus, we realized, needed to be on the total cost of care. Don't just talk about the unit cost of a drug, but learn about the total cost that it takes to manage, say, a diabetic patient—including the diagnostics, the outpatient visits, the emergency room visits. This led to an "aha" moment: if we could combine medical-claims data with clinical data collected in an electronic-medical-record system for a defined patient population, we might actually discover ways to improve health outcomes and manage the total cost of care at the same time. And why not collaborate with customers? Prescription drugs represent about 11 percent of total health care spending in the United States. For the other 89 percent, our interests are completely aligned. By working together, we all get access to a broader, richer data environment, and we can work together on creating state-of-the-art access tools and real-world methodologies.

So we took this idea to potential partners. From the beginning, this was about true collaboration and strategic fit, not an "I'm gonna win more than you win" mentality. When we presented our vision to HealthCore[1] and its parent company, WellPoint, we quickly realized that their views on all of these things were so similar to ours that everyone's jaws kind of dropped. It was a quick connect. We announced our collaboration in February 2011.

Certainly, there was some internal resistance at first. In some cases, we were asking our people to think in dramatically different ways than they had for the bulk of their careers. This is especially true in R&D, where we're now bringing in the voice of the payer much earlier in the development process so we can "lose the losers" quickly and not take products to market that won't be valued by the people paying for them. And of course we still negotiate with WellPoint on individual drugs, so the increased transparency acts as a double-edged sword: if the collaboration helps us get new evidence that supports a price point we set, that's extremely valuable. But sometimes it goes against us too.

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1   A research subsidiary of US-based health insurance company WellPoint.

> **Box 1: AstraZeneca's "big data" partnership (continued)**
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> The key to turning around the resistance and getting to where we are today has been the senior-level involvement and support we've received from the start. Our leaders recognized that this approach is a long-term play: there may be quick wins and short-term gains for the company, but to really have a broad impact on the company and the industry, we have to manage the complexity and growing pains. One example was the way we brought together top-notch biostatisticians, epidemiologists, health economists, and programmers working throughout the company and created a new group focused on real-world evidence. Without the support of engaged and interested leadership, making that happen would have been like pushing a rock uphill.
>
> While this partnership is still in the early stages, HealthCore and AstraZeneca personnel are operationally aligned and set up, and working together very well. We have a number of joint studies under way and are in the throes of completing the first one, which will be ready for discussion with payers soon. Still, both sides see this as the first phase of a broader, industry-wide collaboration. Eventually, we expect this will include other health insurers, pharmacy benefit managers, providers, employers, other pharmaceutical manufacturers, and even federal and state governments. It won't be just about pharmaceuticals but about much more: Which diagnostics make sense and which don't? Which medical devices? What leads to errors or high readmission rates in hospital settings? What key health issues need to be addressed in a given local community? Through big data, we can learn things about health care that we could never get at before. And that's really what we're setting out to do.
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> *This commentary is adapted from an interview with Sam Marwaha, a director in McKinsey's New York office.*

Data-related threats and opportunities can also be more subtle. After using an innovative product-bundling approach to improve market share, for example, a European telecom company saw large-scale data analysis as a way to boost momentum. The company's executives believed it could press its newfound advantage by pinpointing exactly where its sales approach could make further gains and by studying the behavior of customers to see what factors motivated them to choose one brand or product over another. Doing so would require interpreting two massive and growing volumes of information: online search data and real-time information—shared by consumers across social networks and other Web-based channels—about the company's products and services.

2. Identify big data resources . . . and gaps

Framing the basics of a big data strategy naturally leads to discussions about the kinds of information and capabilities required. At this point, executives should conduct a thorough review of all relevant internal and external data. The audit should also consider access to analytical talent as well as potential partnerships that might help fill gaps. Such an audit will not only create a more realistic view of a company's capabilities and needs but can also spark "aha" moments—for example, as executives identify "data gems" cloistered inside their business units or recognize the value of creating the right kind of partnership.

The retailer's audit focused on internal data the company gathered but wasn't using to potential. This information—about product returns, warranties, and customer complaints—together contained a wealth of information on consumer habits and preferences. The audit also revealed an obstacle: none of the information was

integrated with customer identification data or sufficiently standardized to share within or outside the company. Therefore, the information was rarely analyzed for marketing insights and couldn't be marshaled to assist sales reps in customer interactions or supply chain executives in serving vendors. Happily, the audit also helped identify a team that could help solve these problems: in-house data analysts whose siloed efforts were underused.

For the European telco, the discussions centered around how it might tap into the rising tide of online conversations about individual companies and their products—the millions of relevant microblog posts, social-media conversations, search term keywords, head-to-head brand comparisons, and customer feedback postings that were now available on the Web. Recognizing the importance of the effort—and the company's relative lack of econometric and analytical skills to manage it—the telco's CEO helped recruit an outside analyst with the necessary stature to lead a new "collective insights" team.

3. Align on strategic choices

Once companies identify an opportunity and the resources needed to capitalize on it, many rush immediately into action-planning mode. This is a mistake. Data strategies are likely to be deeply intertwined with overall strategy and therefore require thoughtful planning when a company decides how its resources should be concentrated to achieve the desired results.

In some cases, that could mean putting powerful data analysis tools in the hands of frontline workers. In others, it might mean amassing data and ramping up analytical talent to create a first-mover advantage.

It's also important to view big data in the context of competing strategic priorities. When one CEO looked closely at what it would take to boost the data orientation of his company's sales and marketing function, he discovered that it would be necessary to acquire some key data vendors, replace a strategy leader, and invest heavily in analytical talent. In the end, deciding not to pull the trigger, he said, "I can see how this has moved to our industry's backyard, but until I consolidate five acquisitions and deal with major revenue shortfalls from products coming off patent, we'll need to think small." While backing off was the right answer for this company at that time, it clearly carried risk. Before demoting big data on your strategic priority list, ask whether you've thought hard enough about its long-term strategic potential and about what your competitors may be doing while you wait.

As for the retailer, its executives determined that the goal was to create an information grid that would provide for a range of data-sharing and -analysis activities across the company. However, the leaders decided against a company-wide initiative, since the retailer's culture generally favored innovation at the business unit level. Therefore, the retailer tapped an executive with technology and entrepreneurial experience to launch a study across key business units—an effort that ultimately surfaced 80 potential big data projects. Each was then ranked by its net present value and mapped against the company's strategic objectives.

The first project the retailer pursued was a revamp of its fragmented customer-relationship-management (CRM) system and the creation of a single data pool that company executives plan to use in multiple ways. One pilot project, for example, is exploring the use of tablet devices by salespeople, in hopes that easier access to inventory data, customer profiles, and product information will help them close more sales. A second initiative enlisted online developers to create virtual storefronts for

third-party Web sites. By using algorithms, survey market prices, and predetermined discounts to link the storefronts to the inventory systems of the retailer and its vendors, the initiative is helping it counter its competitor's third-party sales strategy—while also improving the commissions of its sales force and vendors.

In the case of the telecom provider, a cross-functional executive committee was created to oversee the analytics team and ensure that its efforts were aligned with the company's strategy. The committee focused the team's efforts on answering two questions: "How competitive are our brands in the minds of users when they make purchase decisions?" and "What key buying factors matter for users, and how well positioned are we to communicate with customers about these factors?"

The team then created targeted data "mash ups"[1] of customer data that it could analyze quickly to gain actionable insights—for instance, sports and other premium TV programming was a key differentiator in purchasing decisions, and customers would be more inclined to purchase a "triple play" service offering (television, high-speed Internet, and voice telephony) if the company deemphasized voice telephony in its marketing messages. This was the *opposite* of what consumers indicated in traditional market research interviews. What's more, the analysis underscored, and helped quantify for executives, the importance of a bigger strategic imperative: the need to add mobile telephony as a fourth service to complete a "quadruple play."

4. Understand the organizational implications

Finally, it's important to note that the threats and opportunities associated with big data often have organizational implications that only concerted senior-executive attention can address (see Box 2, "Big data for the CEO"). To be useful, data must cut across internal boundaries, yet this often goes against the grain of an organization and creates friction.

At one insurer, for example, a senior leader observed that crunching the numbers on highly detailed aspects of customer behavior would allow the company to price risk more finely and probably help to increase market share. But that knowledge also represented a threat—an internal one—that impeded action: sales agents worried that their bonuses, which were tied to profitability, would suffer if the market share increases came at the expense of margins.

Similarly, the European telecom's collective-insights team learned that two things led to the most rapid dissemination of negative word of mouth about the company on social-media and microblogging sites: network outages and any perception by customers that the company had made false advertising claims about its products or network. Yet the marketing and network organizations, rather than cooperate, initially blamed one another for the findings. Only when senior executives forced the two sides to work more closely together and build trust could the company capitalize on the information, by tailoring marketing messages to better explain new-product rollouts and network upgrades.

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1   A mash up is a Web application that combines multiple sources of data into a single tool.

Box 2: Big data for the CEO

Because the means of securing competitive advantage from big data are still evolving, some CEOs believe that big data initiatives should be the sole responsibility of a company's IT or marketing departments—the functional groups where large-scale data sets are most often gathered, analyzed, and applied.

Bad idea. In our experience, big data projects need concerted senior-management attention to succeed. To improve the odds, CEOs should push themselves and their senior teams to answer questions like these:

1. What's the prize?

Opportunities may range from improving core operations to creating new lines of business—even in the same industry. Insurance companies, for example, can use big data to improve underwriting performance now, while over the longer term use it to serve formerly unprofitable customers and ultimately even develop entirely new risk-based businesses. Companies that keep a clear-eyed view of their goals at each stage will have the edge.

2. How do I build a skill base?

By 2018, the United States alone will face a shortage of up to 190,000 workers with deep analytical skills and will need an additional 1.5 million managers and analysts to interpret big data and make decisions based on their findings. CEOs should be thinking now of the critical hires that will help jump-start a big data initiative.

3. How do I get the organization behind me?

To be useful, data must cut across organizational boundaries—yet this often causes friction. Only a dedicated and focused senior team can dispel the various "not for us" objections that will inevitably arise as employees are challenged to work in new ways.

4. How do I scale this up?

Whether a company is planning a single, large initiative or multiple smaller ones, its senior team should be actively planning to take advantage of the resulting opportunities at scale. Stay mindful of the resources required (technological and otherwise) to shift quickly from pilot to implementation modes.

□   □   □

Too few leaders fully understand big data's potential in their businesses, the data assets and liabilities of those businesses, or the strategic choices they must make to start exploiting big data. By focusing on these issues, senior executives can help their organizations build a data-driven competitive edge.

Listening to digital voices

This article is a transcript of a speech given at Call Centre, Portugal, June 2011. All rights reserved.

The web has become a very valuable information platform for market insights. How good are you as a company at listening to and exploiting those "digital voices"?

Dr. Jacques Bughin and Dr. James Manyika

Each day billions of users (companies and individuals alike) are connected to the web for research, communication, transactions, entertainment, commenting and much more. The wealth of information available from these users offers many attractive features for running businesses—from being captured rather freely and stored in digital forms for multiple usages, to reflecting actual intent of consumers and competitors in real time.

But how good are companies in analyzing and leveraging those "digital voices" for their own benefit? Alas, only a few are aware of the opportunity and necessity of using "Big Data". And even if they are, companies rarely leverage the data effectively for new insights. Early movers such as Walmart, UPS and others have been described as gaining major competitive advantage by pushing big data intelligence about their customers and competitors,[1] and we believe that "digital voices" stand for an unique source of insights for companies to run their business, and reap higher returns in the near future.

Big data turned into insights

Digital activities, mostly propelled by the Internet, already accumulate in hundreds of exabytes of information. The trends are clear, with activities likely to cumulate in tens of zettabytes of information over the next 10 years as tools to boost digital activities will continue to grow in number and in intensity. They will be will deployed in increasingly diverse forms—morphing from pc-environment to mobile, upgrading from text to rich media, and expanding to many forms of user-generated content such as social media.

But is this big data only white noise?

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1   Davenport and Harris, 2007, describe case studies of companies aggressively pushing on insights in their book, "Competing on Analytics: The New Science of Winning", *Harvard Business School*.

Various researches are providing evidence that big data is a major source of unique knowledge for those users able to read through it. A recent article in Nature had reported how online keyword search intensity data was a strong forecast in real time of the spread of influenza.[2] Academic research has discovered how sales are correlated with online product search and comments.[3,4] and how micro-blog sentiment analysis could be leveraged to predict stock market index performance.

From Walmart to Harrah's, big data is also concerned with companies.[5] No less than 20 percent of total user searches are branded searches. Similarly, 20 percent of micro-blogs communications (such as Twitter 140 character lines) relates to companies' brands, and 25 percent of product branded searches refer to competitors' brands. About 20-30 percent of social branded mentions are not neutral, voicing clear positive or negative sentiments about brands.[6] The valence, that is the amount of positive versus negative sentiments expressed by users, expressed in this big data, is a strong promotion predictor of a brand.

As an example of how this branded information includes valuable information, consider the case of Belgian telecom companies fighting for their share of triple play. Typically, companies would predict sales based on their past sales performance and marketing effort activations. Sales data from competition would be a good add-on to better prediction. However, data released from costly market research or from public sources, is only released quarter by quarter, thus a few months after sales have been processed. Looking at data retrieval in real time for all telecom operators—the intensity of branded search queries on Google as well as the amount of social mention valence on sites such as Twitter, Facebook and others—we found that the correlation with operator's sales is strongly positive. Further, the correlation increased when sales was matched with search queries and social mentions captured six weeks in advance of sales.[7] This time lag suggests that online data is leading and a powerful indicator of future sales for a company and their competitors.

Big data is not only useful for real time forecasting ("nowcasting"); big data can also deliver major insights. Looking at how much branded search sessions involved competition between our telecom operators, one could witness large asymmetries in the way people were comparing telecom brands. The local incumbent was used as an anchor to other brands twice more often than when people were directly searching products from the incumbent. A clear-cut differentiated value proposition against the incumbent was thus necessary for the other telecom operators to secure better sales. Similarly, a large part of social mention valence for Internet access was not related to price, but to Internet rich media application services. Telecom companies could thus communicate more on their application services to up-sell Internet access. Such insights are relatively new to industry players, and could be monitored and discovered real time.

2   J. Ginsberg, M. H. Mohebbi, R. S. Patel, L. Brammer, M. S. Smolinski, and L. Brilliant (2009), "Detecting influenza epidemics using search engine query data", *Nature 457*, 1012–1014.

3   See among others J. Chevalier and D. Mayzlin (2006), "The Effect of Word of Mouth on Sales: Online Book Reviews", *Journal of Marketing Research XLIII* (August), 345–54.

4   H. Choi and H. Varian, in their pioneer article of 2009, demonstrate high forecast ability of different US retail categories such as car sales, or travel online. Choi, H and Varian, H. (2009), "Predicting the present with Google trends", Google, URL: http://google.com/googleblogs/pdfs/google_predicting_the_present.pdf

5   J. Bollen., H. Mao, and X-J. Zeng (2011), "Twitter mood predicts the stock market", *Journal of Computational Science,* 1, pp.1-8.

6   Jansen, et al., 2009, "Twitter power: tweets as electronic word of mouth", *Journal of the American Society for Information Science & Technology.*

7   S. Asur and B. Huberman, (2010), "Predicting the future with social media", HP working paper

Big data: state of excellence

There is a sense of recognition that user intelligence from big data will become a strategic competency in enterprise. Business intelligence is quoted as the second strongest megatrend affecting company future performance, according to a recent survey by Oxford Economics.[8] Similarly, in our recent fifth Survey of Enterprise 2.0, 75 percent of companies are claiming to be using a mix of technologies to scan the external environment both for competitive insights and new idea generation.[9]

Yet, more sophisticated tools, such as prediction markets, are rarely used. The majority of companies remain unable to uncover much about their competitors' moves, even if they report a limited number of companies (usually 6-8 companies) competing directly in their market segment.

In June 2011 we analyzed a sample of approximately 500 companies across Europe to assess how big data analytics favor the productivity growth of companies. The findings are quite compelling: companies at the frontier of big data analytics, (top 10 percent) are able to generate between 7-10 percent better productivity than others. This finding is robust across industries and across company size, age, etc (Exhibit 1).[10]

At the same time, a long tail of companies (more than 50 percent) have barely invested in data analytics and are not systematically leveraging big data in their business decisions.

Exhibit 1

Revenue-elasticities
%

Category	Value
Raw materials	45
Capital Investments	15
Employment	28
Big data excellence	7
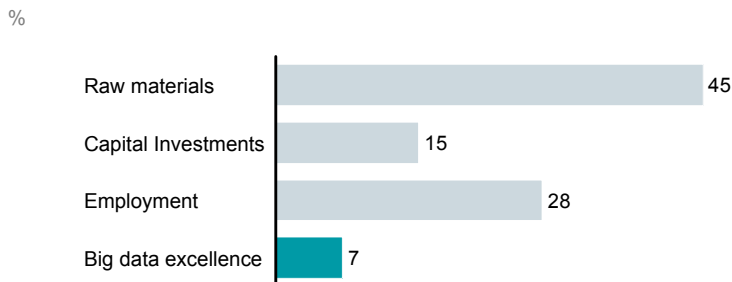
Note: Regression-based elasticities, based on a Cobb-Douglas function; big data elasticities are robust to instrumental variables and to more complex translog function.

SOURCE: Survey on 500 European companies, June 2011, McKinsey

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8   "The New Digital Economy—how it will transform business", Oxford Economics, research paper 2010
9   Jacques Bughin, Michael Chui, Angela Hung Byers, "The networked enterprise holds steady", *The McKinsey Quarterly,* June 2011.
10   The survey covers generic industries such as retail, manufacturing, B2B services etc. The productivity effect is measured using a Cobb-Douglas function where revenue is a function of labor, capital, and the residual Solow element is being correlated with an index of data analytic excellence. The index varies from 0-100% is based on first principal component factor from 6 variables (use of online technologies for customer intelligence, use for competitive intelligence, share of software spending in data analytics software, share of people doing analytics and competitive intelligence, share of customer in co-creation, importance of predictive modeling as tool for business planning). The elasticity of principal component to revenue growth is between 2-3%, depending on specification used and industries. Given top companies are 3 times more savvy in analytics than the average, reaching the frontier implies: 2.5-3 times 3, or 7.5-9 % upflit in revenue productivity growth.

Exploiting big data

So what should companies do to exploit big data? At least three elements will compose the "digital voice" journey.

1. Identify data assets

Organizations should start by making an audit of data they own (proprietary), and of public data they share. In general, public data are an order of magnitude larger than proprietary data, but usually a mash up of both sources of data is critical to create value (e.g., the telecom example above provides a big data sales forecasting tool by matching online public search and social media with proprietary sales).

2. Identify value spaces

Companies must assess the generic and industry-specific big data pools of value, on top of company-specific pools. Given billion of searches, search queries provide some strong generic big data insights, for example how searches that are linked to television campaigns usually boost sales performance. Regarding industry, each industry has different spaces where big data may create value. In B2C, valuable information will come from a myriad of consumers, while in B2B, the numbers of suppliers/customers are a lower order of magnitude, however the level and intensity of interactions can be much deeper. In retail, RFID data from purchase scans are unique dataset to leverage. In telecom, the pattern of calls give unique insights into the social networks of each phone or Internet subscribers. In media, recommendation tools work very well for books and music.

3. Build capabilities

Hal Varian, now chief economist at Google, puts it to the extreme. In his view, while econometricians were once all flowing to Wall Street in their quest to use predictive analytics to beat the market, the same specie is now being used by companies to run their customer insights. In effect, big data requires new forms of talent—who can run a myriad of experiments and test them on heavy sets of data, mashing up private, proprietary data with public-based data from online.

Companies are still relatively shy on aggressively recruiting this type of talent. They struggle to define the role and where it belongs within the company. The priority is usually misplaced—what matters is to have a cross-project between IT, marketing, and business planning, with enough talent devoted to create this intelligence engine. Only when at scale will the discussion occur regarding who owns what, etc. The project should be seen as a clear corporate-wide imperative.

□   □   □

The Internet and the big data it is churning every second, has become an unique platform of real time insights. Companies should follow early best practice to exploit those digital voices for competing advantage. The pay-offs are material, the key challenge is nevertheless to establish a clear big data roadmap and build with it the capabilities to exploit this advantage. *Are you ready for it?*

Digital user segmentation and privacy concerns

This article is forthcoming in the Journal of Direct Data and Digital Marketing,[1] November 2011. All rights reserved.

How does one define privacy on the Internet? While a large number of Web users are greatly concerned by cyber-privacy issues, their willingness to pay to ensure their privacy protection is in contrast small. In fact, the amount users are willing to pay to secure their privacy is an order of magnitude below the value users extract from using free online applications such as Facebook, Google, and many others. The value of privacy is also not homogenous—in fact, quite a few segments are visible with different trade-offs between the value of cyber-privacy protection and use of online applications.

Dr. Jacques Bughin

Introduction

"In the Google-Facebook race, privacy will determine the winner"[2]

There is no doubt that concern for privacy has become an important matter on the Internet (GBDe, 2003, Market Research Limited, 2005). A Google Web search regarding online privacy generates no fewer than 700 million entries in July 2011. Assessing the evolution of Web, search queries on *Google Insights* in the same month shows that "Google privacy" and "Facebook privacy" terms have grown quickly in importance—even if searches linked to online privacy, in total, have declined relative to all searches worldwide.

But beyond the obvious, the picture remains blurred: if we expect privacy concerns to be important, why then would users not take the appropriate actions to protect themselves from the risks of personal data leakage? Today, online users still rarely choose the opt-out service that prevents third parties from using their data (West, 2008). Similar behavior was already noted by Hahn and Layne-Farrar (2001) regarding direct marketing purposes. Acquisti and Gross (2006) also found that stated concerns about sharing information are (at best) a weak predictor of someone joining or not joining an online social network such as Facebook.

As Chelappa et al. (2005) concede, the question is therefore not whether online users are concerned about the risks of personal data leakage. The real question is how online users weigh the value of privacy protection against the value of free Web use. In this study we

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follow seminal work by Hahn et al. (2002; 2003) and use conjoint analysis to estimate trade-offs made by users between the benefits of using the Web freely and the risks of personal data becoming public.

Significant works by Hann et al. (2002; 2003) and others have concentrated on e-commerce Web sites. Here "trade-off" is defined as the convenience of using e-commerce services versus the risk of third-party information use. For our study we choose to focus on all other application domains outside of e-commerce. Here the value is based on the fact that these websites are mostly ad-funded and provide free services. However, users face the risk of revealing too much information, which could be employed without consent, for targeted advertising or any other use. The applications we test include all major online domains, from online social networks and wikis to online search, user-generated video, and others. The scope here is privacy issues linked to the unpermitted use of personal data and Web-surfing behavior information, including targeted advertising. By concentrating on all applications besides e-commerce, we will contrast how people make trade-offs on the Web for the majority of their online time usage. Other distinctive aspects of our research are that it covers four countries (the US and the three largest economies in Western Europe—France, Germany, and the UK), and is timely (survey conducted in 2010). Also, it develops a comprehensive clustering of users' trade-off valuation. While other research concentrates solely on clustering along the axis of privacy value, we segment user behavior along both axes of usage and privacy valuations.

Our three main findings are as follows. First, the conjoint analysis demonstrates a large spread in the value of cyber-privacy, although with a rather low average valued at about €4 per month, per user (or about €8 per month, per household) for the four countries analyzed.[3] This value is also significantly lower than the value users attribute to using free, ad-funded, online services. This is weighted €38 per household per month. Second, the value of privacy is positively—albeit very weakly—correlated with the stated concern of users regarding the risk of abuse of their information. This finding confirms the thesis that what really matters is the relative value of protection versus the free use of online applications. Third, we find up to seven segments regarding how online users make trade-offs between usage and privacy protection. For Marketeers, this implies that a "one size fits all" approach to privacy and online services is an ill-advised strategy and that more optimal solutions would require segmentation tactics.

Data and methods

Sampling

The research was based on an online survey administered in the spring of 2010 with a random sample of 750 online broadband users. Some 75 percent of the material was used in the final analysis after cleaning out incomplete surveys or inconsistent results.[4] The survey was originally requested by the Internet Advertising Bureau (henceforth, IAB, 2010) to estimate the value of online applications. We refer those interested in further details of the data collection to the IAB report. In this paper, we focus on four countries—the US, Germany, France, and the UK.

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3   To put this value in perspective, it is lower than price points typically charged for paid security software online, e.g., Eset, McAfee, and others.

4   We formally scanned the distribution of answers. The answers lying in the extreme parts of the distribution (more than two standard deviations of the distribution) were reviewed and inconsistent answers were then removed, e.g., users spending five hours a day on the Internet, but only spending on search.

We used a list of 16 Internet applications/services clustered into three main domains:

- **Communication:** e-mail, instant messaging, Internet phone, and social networks

- **Entertainment:** gaming, gambling, virtual worlds, music/video, advanced upload services, podcasts, content reading

- **Information Services** search/comparison shopping, maps, directories/yellow pages, blogs, and wikis.

The questionnaire includes socio-demographic elements, Internet usage, stated services interest, and willingness-to-pay as well as a conjoint aimed at assessing the value trade-off between use of services and privacy leakage risk. We compared the sample with the Internet population of each country along five key variables. Regarding access, we looked at: a) mix of access technology, b) access performance (download speed), and c) monthly access spent; for services we looked at: d) time spent online and e) usage rate of services such as search, social networks, and online video. Based on these variables, the sample is statistically representative of the population. By mid-2010 the typical sampled online household was using a DSL line with an average speed of 4Mbp/second at a price of €31 per month. Users were also accessing the Web 23 days a month and were spending about two hours a day accessing online applications, including the Web. Two global premium brands (that is, brands that users are willing to pay for in order to continue accessing, even if there are free alternatives) stood out in the four countries—not surprisingly, these two brands are Google (and some of its offspring, such as YouTube) and Facebook.

Statistical methodology

Methods used to estimate value of usage and privacy are usually based on opinion polls/stated preferences. However, it is well known that directly-stated preferences are usually a biased indication of true behavior, especially when it concerns free services (e.g., because it leads to free-riding issues). Furthermore, we have already highlighted that stated concerns typically weakly correlate with true values when related to online privacy. Conjoint analysis alleviates these problems. This technique involves presenting respondents with a set of trade-offs to make between service/product benefits and related costs (privacy, paid service, etc.), for which they rank their preferences. For each product and service benefit, the ranking contribution is the part-worth times the level of that product/service benefit usage. Therefore, the part-worth measures the marginal utility of the product/service in the ranking of the conjoint stimuli. This method, while common practice in marketing science, has been only rarely used in assessing privacy issues. Exceptions are Hann et al. (2002, 2003) and Kondo et al. (2009).

One critical element in the design of conjoint research is to have a limited set of domains/attributes (five to seven, but less than ten) for which to test (Green and Srinivasan, 1990). We considered six attributes in this study. The first three are the three "domains" of online applications referred to above, that is communication services, (instrumented by the variable denoted, COMM); entertainment services (ENTER), and information services (WEBS). The next two attributes are "nuisance attributes", that is, targeted advertising (ADV) and improper use of user data (PRIVACY). The last one is PRICE. We defined price as "the price paid on top of everything else to go online", e.g., access. Valuation of using services is uncorrelated with access price in our sample.

For each of these attributes, we created a set of levels (usually three), as shown in Exhibit 1. Since this combination leads to a large set of conjoint stimuli, we reduced the set of stimuli to about 30 possible combinations. For example, there is no point in simulating a bundle of communication only, for €25 per month, per user. Finally, the currency reference was that of the user's country, at the euro/currency rate of April 1, 2010.

Exhibit 1

Conjoint attributes and levels

Attributes	Levels
Communication	▪ No access to communications and social network services ▪ Access only to basic services (mailing, instant messenger) ▪ Access to all services (mailing, instant messenger, social networks, internet phone, …)
Entertainment	▪ No access to entertainment ▪ Access to basic music and UGC video ▪ Access to all services (music, video, games, gambling, web TV, …)
Information services	▪ No access to information services ▪ Access to search engines (search engine, directories) ▪ Access to all services (search engine, directories, comparison, shopping engine, web mapping, yellow pages, wikis, blogs, …
Advertising	▪ No advertising at all ▪ Advertising limited to rich media ads (video, audio) ▪ Advertising limited to pop-up banners ▪ Heavy rich media ads (video, audio) ▪ Heavy pop-up banners
Information required	▪ No personal info required ▪ Limited personal info required (name, age, usage, …) ▪ Full info required (name, age, usage, credit card, …)
Monthly price	▪ Range of prices tested: 0, 3, 6, 9, 18 EUR per month

The statistical model used is a random probit model, in which we observe the rank preference of each respondent—the dependent variable, against various combinations of the attributes (COMM, ENTER, WEBS, ADV, PRIVACY, PRICE)—the independent variables. Each attribute (except PRICE) has a random individual component, reflecting that each individual may have specific preferences around the average core value of each attribute. From the law of large numbers, a normal distribution is hypothesized and maximum likelihood techniques are used to derive the best efficient estimates of the coefficients vector, B, of the model, linking attributes to rank preferences. Formally, the empirical model to be estimated by maximum likelihood is defined as, for the j-th individual and the i-th level of attribute:

$$\text{Arg max } Y_{ij} = B'.X_j + e_{ij} \qquad (1)$$

Where:

$$Y_{ij} = Pr(I_{ij})/(1 - Pr(I_{ij})) \qquad (2)$$

$$X_{ij} = [COMM_{ij}, ENTER_{ij}, WEBS_{ij}, ADV_{ij}, PRIVACY_{ij}, PRICE_j] \qquad (3)$$

And e_{ij} is specific to the j-th individual and I (= 0.1) is the indicative of the conjoint stimulus being ranked as best choice by the j-th individual. Detailed results are available upon request. Exhibit 2 presents the derivation of the willingness-to-pay

per service, at the sample mean. The goodness of fit is large (pseudo-R2 of more than 0.7) and each coefficient of the attributes, as well as derived willingness-to-pay, are all statistically significant different from zero. The major insights from the maximum likelihood estimates are as follows:

1. The average willingness-to-pay for online services is €23 per month, per user (and up to €38 per household). This is higher than what a broadband home pays for its monthly connection in our sample and up to four times what service providers collect from exposing users to advertisers online. Hence, the surplus value collected by broadband users is quite large.

Exhibit 2

Estimation results

Variables	Coefficient	Implied willing-to-pay
COMM	0.210	10.4*
Enter	0.128	6.4*
Webs	0.141	7.0*
ADV	-0.054	2.8**
Privacy	-0.032	1.6*
Price	-0.020	N/A

* P<0.01
** P<0.05

2. On the other hand, the value of privacy is only €4 per month, per user (or roughly €8 per month, per household). This is about one-fifth the value of usage and might explain why despite online concern; usage of online applications is high and growing quickly.

3. Online privacy value is roughly equally split between limited targeted advertising and respect for data privacy.

4. The value curves are plotted in Exhibits 3 and 4. They demonstrate a significant spread around the mean, e.g., with some users not willing to pay anything for cyber-privacy and a few willing to pay up to €100 per month, per user. This large variance of value calls for user segmentation in order to isolate clusters of more homogenous behaviors (see below).[5]

5. Finally, we also asked people to directly state their willingness-to-pay for usage and privacy protection. We found positive (although not statistically significant) correlations (respectively, 14 and 6 percent) between stated and conjoint-based value for usage and privacy. In general, we found that low-value people were overstating their value and vice-versa. In most cases, low-value people were also overstating their privacy concerns. This is in line with other work findings (e.g., West (2008) and confirms the superiority of the conjoint method.

5   While not reported here, we similarly found that the standard deviations of the parameter attributes are all significant, confirming that a random model was appropriate and that user value distribution is large.
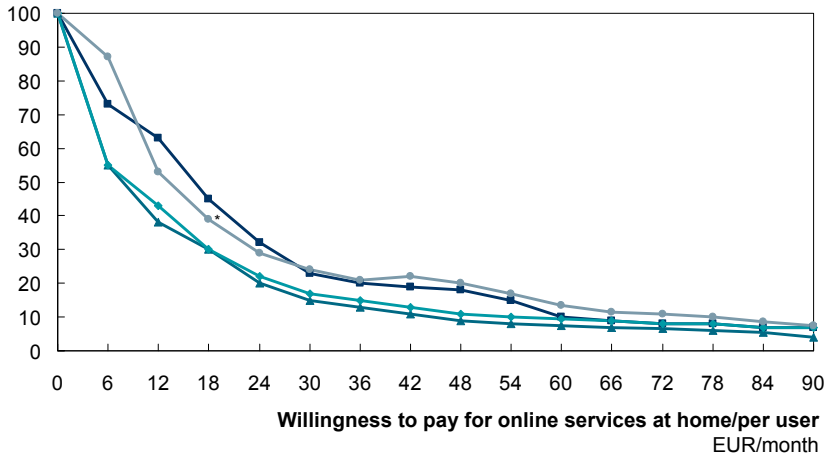
Exhibit 3

Usage value curve
EUR/month

United Kingdom
Germany
France
United States

Percent of respondents
%

Willingness to pay for online services at home/per user
EUR/month

* Average – 23.3 EUR/month

Exhibit 4

Cyber-privacy value curve
EUR/month

United Kingdom
Germany
France
United States

Percent of respondents
%

Willingness to pay for online services at home/per user
EUR/month
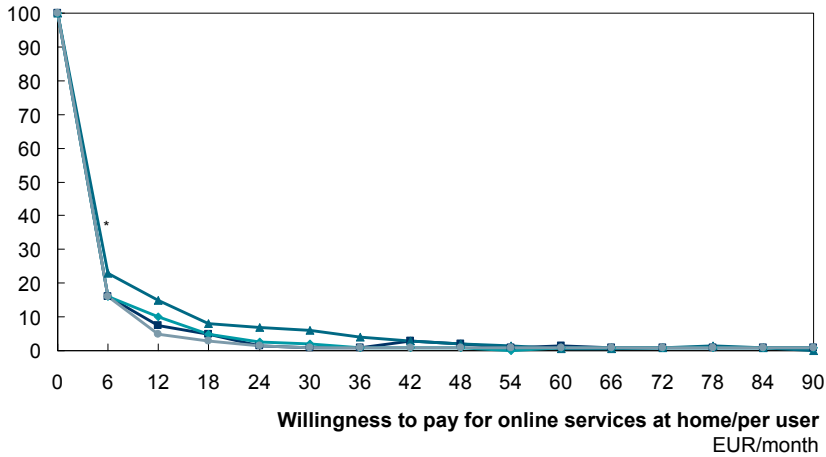
* Average – 4.2 EUR/month

Online users segmentation

The shape of the value curves and the statistical evidence for the random logit model demonstrate that individuals systematically differ in their trade-off between value of cyber-privacy and that of online usage. We used clustering to assess the prevalence of various cohesive segments in the online population.[6]

Although other studies, e.g., Westin (2001) and Hann et al., (2002) demonstrate three clusters, these studies did not integrate the diversity of applications online as our research does. Furthermore, Westin (2001) used opinion surveys, which we feel to be rather "noisy" when it comes to their true representation of online privacy. In our sample we distinguish up to seven clusters, as shown in Exhibit 5.

There is a large segment (26 percent of users) where the average value of both usage and privacy match: about €25 per month, per user from using online applications, for a value of privacy of €3.5 per month, per user. We label this segment the "Average value users". Around this segment, we have a large chunk of low-usage value users (59 percent of user population) versus a more narrow set—15 percent—of Internet users who gain very high surplus value (€80 per month, per user) from using online applications.

Exhibit 5

Segmentation

		Willingness to play				Pain points		Total
		Communication	Entertainment	Web services	Total user value	Advertising	Privacy	Surplus
"High user value" segments	Premium information 2	21.0	17.5	67.6 =	106.1	-1.8	-1.2 =	103.1
	Premium entertainment 1	18.9	66.0	18.2 =	103.1	-1.7	-0.4 =	101.0
	Premium communication 4	69.2	15.0	18.3 =	102.5	-1.5	-1.2 =	99.9
	Comprehensive internet 7	29.1	12.0	20.3 =	61.4	-2.9	-1.8 =	56.7
	Traditionalists 26	22.0	16.0	19.3 =	55.3	-29.5	-9.1 =	16.7
	Average value 26	11.6	4.6	9.1 =	25.3	-2.3	-1.1 =	21.9
"Low user value" segments	Fair deal 19	3.9	2.2	3.9 =	10.0	-5.5	-4.5 =	0
	Low deal 2	2.7	1.4	2.4 =	6.5	-1.0	-0.4 =	5.0
		10.2	5.0	8.1	23.3	-2.6	-1.6	19.1

Size Percent Low High

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6   Hierarchical clustering was applied using average between-group linkage with (dis)similarity measured by the squared Euclidean distance to derive cohesive groups. A hierarchical method is recommended when one has no prior information on the number of clusters or cluster centers (see Hann et al., 2003).

Low usage value segments

Regarding the low-usage value, we distinguish two sub-segments, with one—which we label the "Fair-deal users" (19 percent of user population)—placing high value on cyber-privacy, up to double the respondent average. This is a segment of online users for whom the value of protection is as high as the value of usage, bringing net surplus to virtually zero. Users in this segment are typically more male, married, and less educated.

The second segment, "Low-value users" (40 percent of the population), consists of online users with the lowest willingness-to-pay for protection as well as for usage value. This segment is over-weighted in terms of age and consists of relatively more people in non-urban areas.

High usage value segments

About 14 percent of Internet users receive net value above the "Average-value users" segment. Four niche "domain premium" segments are available in the data.

The first domain premium segment is called the "Premium entertainment users", and is composed of 1 percent of users generating significant value by consuming entertainment services (approximately 65 percent of their total surplus versus approximately 20 percent market average). This niche segment focuses on using TV/videos and music, and is characterized by a higher percentage of single urban Internet users (73 percent live in urban areas versus 59 percent for the full-sample average; 45 percent versus 31 percent are single).

The "Premium information services users" is the second niche segment composed of 2 percent of users. They get large value from using information Web services (approximately 65 percent of their total surplus), especially search and map-direction services. In general, this segment is characterized by more highly-educated users and users who tend to be married with children. Finally, the last niche segment, labeled "Premium communication users", is composed of 4 percent of users who place a strong value on communication, particularly e-mail, social networks, and instant messaging (approximately 70 percent of the total surplus value). This segment is characterized by a propensity toward young, urban, female Internet users. Finally, we have one segment representing 7 percent of users, which we label the "Comprehensive Internet users". This segment generates value from intensively using all types of services (entertainment, information, and communication) and is slightly more female and single than the user population average.

Privacy segment

Finally, the seventh segment stands for only 1 percent of the population, it also generates large value from using all online services, but places major value on the respect of their privacy—that is, close to €40 per month, per user. We call this segment the "Cyber-privacy fundamentalists". They tend to have the lowest rate of marriage and have low incomes. We can contrast this with Westin (2001) and Dinev (2003). Westin found a much larger segment of fundamentalists, in the range of 15 to 20 percent of the user population. However, his segmentation is based on stated concern and not (more accurately) on the value that users place on cyber-privacy. In our results, we have really two "privacy-value" segments, but the larger one (19 percent) is as much claiming low-usage value as it is calling for cyber-privacy.

□   □   □

This paper has used conjoint analysis to assess the trade-offs made by online users between online services and the risk of privacy leakage. What makes our paper distinctive is its focus on all domains of online (outside of e-commerce) for four large Western economies (the US, France, Germany, and the UK) and its clustering of trade-off behavior. Key findings are that there is large variance among online users regarding those trade-offs, with up to seven user segments. Furthermore, the value users attribute to privacy, i.e., how much they are willing to pay to protect themselves against personal data leakage is low relative to what they get from using online applications such as Facebook, Google, and others.

In general, this article also shows that Internet users have quite diverse opinions about privacy and advertising, and about the value of ad-based free services. Marketeers would be well advised not to apply too simplistic, "one size fits all" strategies when it comes to advertising exposure and data privacy guarantee.

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"Nowcasting" the Belgian economy

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http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1903791, September 2011.

Big data can be an important source of real time intelligence. As a case example
that proves this, we show that the interface *Google Insights for Search* is able to
"nowcast" the Belgian economy quite accurately, and much ahead of released
official economy statistics. In general, search queries account for between 16 to 46
percent of the variance in fluctuations in retail sales and unemployment in Belgium,
for the period 2004 to 2011.

Dr. Jacques Bughin

*"We call it 'nowcasting': meaning forecasts of current events for which data has not been
released"*[1]

Introduction

With the mass-market penetration of broadband access and users spending more and
more time online, the Internet has become an important laboratory for testing and
anticipating various consumer behaviors. Furthermore, online data offers appealing
analytics advantages. In Belgium alone there are millions of online search queries and
social mentions each month. These are true markers of actual (as opposed to stated)
behaviors and what is more, they can virtually be collected in real time rather than in a
matter of months, as is the case with the release of some offline data.

This last feature has been exploited recently by a number of economists to nowcast many
macro-economic factors—from consumer sales to unemployment. Choi and Varian (2009)
were among the first to leverage the billions of online searches on Google to demonstrate
the high forecast ability of different US retail categories, such as car sales and online
travel booking. This paper follows this line of research. It uses *Google Insights for Search*,
an extension of *Google trends*, similar to Choi and Varian (2009), to assess how Google
search intensity correlates with key macro-economic indicators of the Belgian economy.

The core hypothesis of this paper is that the "nowcasting" potential should be material.
As indirect evidence of this hypothesis, Belgian consumer decision-making surveys have
demonstrated that online searches stand for one-quarter of all touch points to sales

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1   Choi, H. and Varian, H. (2009), "Predicting the present with Google trends", Google Inc.

(Bughin, 2009), with search importance growing to 65 percent of all touch points to sales for categories such as travel. Second, direct statistical nowcasting research using online search queries has shown great promise. In the US—and alongside seminal work by Choi and Varian (2009)—Schmidt and Vosen (2011) have used factor analysis on multiple consumer search categories to build an index of retail search. This index was not only used successfully for nowcasting US private consumption, but it also proved to outperform key survey-based indicator standards, such as the University of Michigan Consumer Sentiment Index and the Conference Board Consumer Confidence Index, in most in- and out-of-sample forecasting exercises. This result was recently confirmed by Kholodilin, et alii (2010).

Nowcasting via online search intensity[2] has also been tried out for countries other than the US. Carrière-Swallow and Labbé (2010) successfully managed to nowcast car sales in Chile, and Askitas and Zimmermann (2009), D'Amuri and Marcucci (2009), and Suhoy (2009) succeeded in using online searches to forecast unemployment in different countries, such as Israel, Germany, and Italy.

After a quick background description of Google Insights for Search as well as of our analysis method, we provide and explain nowcasting results on Belgian retail categories and unemployment. This paper uses a general ECM representation to assess the correlation in fluctuation and in level between search queries and macro-economic series. Search elasticities to fluctuations in retail sales and unemployment claims are all positive and statistically significant. *Level* elasticities are also found to be significant for food retailing. In general, the results show that search queries have good explanatory power in assessing macro-economic fluctuations in Belgium, with search queries explaining between 16 and 46 percent of variance in the fluctuations analyzed for the period 2004 to 2011. Furthermore, search queries series are aggregate of weekly data available on Google Insights in *real time and ahead of data* published on macro-economic variables. This is why search queries certainly have some ability to nowcast the macro-economic cycle in Belgium.

Background and methodology

Background

Online search to nowcast economic performance relies upon the promises of big data—in other words, online search is a major activity on the web and takes place billions of times a day worldwide. In Belgium, for instance, more than 90 percent of Internet users search online in a month and perform millions of searches a month, according to Comscore.[3]

Another strand of academic literature has also leveraged the fact that social networks, blogs, and micro-blogs have been growing in importance very quickly, and as another source of big data should also be quite informative. Asur and Huberman (2010) use tweets from Twitter to accurately forecast movie sales. In a companion paper, Bughin (2011) uses both social mentions and online searches about telecoms service brands to demonstrate that searches as well as social mentions contribute to explaining differences in product sales performance among telecoms brands.

In this paper, we examine how online big data can be used as an effective supplement to assess economic performance. Typically, forecasting the business cycle is critical

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2   We will use this term throughout this paper even if, technically speaking, the term is a bit of an abuse of language. In the application of Google Insight for Search, data are indeed rescaled so that the largest volume of search is indexed at 100. We use log form in the regression model to cope with this limitation of the data.

3   http://www.comscore.com/Press_Events/Presentations_Whitepapers/2011/2010_Europe_Digital_Year_in_Review

for economies and is generally considered to be a very difficult task. Given the large amount of time series data collected in online search queries—as opposed to, say, micro-blogging—we focus on big data from online searches.

Specifically, we use *Google Insights for Search*, an analytic platform extending *Google trends*, which has been publicly providing a weekly summary of statistics on online users' search behavior since 2004. The Google search data originally released related to text- and web-based searches, but has been recently extended to include, e.g., product searches and rich media formats (images, videos, etc). Google remains by far the largest search platform worldwide, with a share of horizontal searches close to 65 percent. In Europe, Google's share of horizontal searches in Belgium measures nearly 85 percent. On the other hand, the main platforms for vertical searches are socially based, including YouTube for video (Veho is second in Belgium), and Twitter and Facebook for comments. We estimate that in Belgium, text-based searches account for some 85 percent of searches (the balance is images, audio, pictures, and video), while the bulk (92 percent) of searches arise via the traditional pc/laptop (the balance is mostly mobile).

The compiled search data provided freely by Google is presented for the selected search terms and geographies, allowing us to zoom for particular categories, such as shopping searches to attempt nowcasting retail sales, and to collect data for Belgium. Provided there is enough search data, we can also zoom by regions, and even provinces and cities. Bughin (2011) leverages this geographic split to develop "heatmaps" of telecoms brand performance in Belgium.

As described by Google on its *Insights* web page, the search query share is a ratio of the number of searches for a particular search term relative to the total number of searches. It indicates the probability that any user will apply a particular search term when searching the web. Moreover, the Google search data are relative to the initial 2004 query share values (set to zero) and therefore shows the relative popularity of a certain search term compared to its popularity at the beginning of 2004. When we consider, say, two competing brands, the relative search intensity shows how the share of "voice" among two competitors has evolved over time relative to their original popularity in 2004. Bughin (2011), and Choi and Varian (2009), respectively, leverage this feature to demonstrate how searches for telecoms brands (respectively, automotive brands) are strong predictors of their relative sales performance.

The narrower the query term selection, the likelier the search data could be biased. To this aim, Google also aggregates search query data in 27 available main categories, from *"Automotive"* to *"Health"*. A category such as *"Telecommunications"* can be a good predictor of telecoms services subscription; similarly, subcategories such as *"Television"* in the *"Entertainment"* category, can be an appropriate query aggregator for predicting the evolution of digital TV subscription sales (Bughin, 2011).

Methodology

The objective of this article is to replicate the findings in other countries and show that searches can be used for *nowcasting* some macro-trends in the Belgian economy.

The ECM model

Most of the recent literature has used simple auto-regressive (AR) models, augmented by search queries as an extra term variable, in order to see how search intensity could add *explanatory* power beyond simple AR models. Also used was the statistical model to assess its out-of-sample *forecast* power against traditional benchmark indices. This paper focuses on the explanatory power of search intensity for several macro-trends

and does not investigate forecasting power. We look at different contributors to retail consumer spending as well as at unemployment claims in Belgium.

We follow the literature in the design of a rather straightforward auto-regressive model and we extend the simple AR model used by many authors to an ECM model of the form:

$$Y_t = a + b.S_t + d.Y_{t-i} + e.S_{t-i} + c'.C'_t + f'.C'_{t-i} \tag{1}$$

Or in traditional, ECM form:

$$Y_t - Y_{t-i} = a' + b.(S_t - S_{t-i}) + (d-1).Y_{t-i} + (e+b).S_{t-i} + c'.(C'_t - C'_{t-}) + (f'+c').C'_{t-i} \tag{2}$$

Where:

a) Y is the series we aim to nowcast, S is the value of search queries extracted from Google for the adequate search term, at time *t-i.*;

b) C' is a vector of control variables;

c) The coefficients vector (a, b,c, d, c',f') are coefficients to be estimated.

The coefficient d measures the hysteresis in Y, and the finding that either b or e can have statistical significance would imply that search data have some nowcasting ability. In general, most academic literature on nowcasting implies that b is different from 0, an indication that search intensity affects changes in macro-variable Y. The equations (1) and (2) also allow testing for a structural equilibrium relationship between search intensity and *the level* of the macro-economic variable Y. The value (e+b)/(1-d) provides an estimate of the complete effect of search contribution on Y.

The above equation (1) may only be estimated by typical least square methods, provided underlying series are stationary. This is not the case for, e.g., unemployment claims data. Therefore, we rather estimate (2) via the first difference of the variables. We further use the fitted data from (2) to get an estimate of Y and we re-estimate (1) to get unbiased standard deviations of parameters (Engle and Granger, 1987).

We do not have a specific model hypothesis to predict how retail sales can evolve. We use a pure AR model accordingly, without adding any extra variable of control C, for retail sales. For unemployment, literature points to strong evidence of a short-term trade-off between inflation and unemployment—an empirical law named the Phillips curve (Fisher, 1973).[4] For this reason we use inflation as an additional control C variable in our ECM model of unemployment, with the aim to test the joint hypothesis that c <0, f=0.

Data collection

Regarding the ECM model for unemployment, we use monthly national and regional series of numbers of people claiming benefits from the ONEM/OESO.[5] The inflation rate is the monthly national inflation published by the Belgian Institute of National Statistics. The series of retail sales and sub-categories (food, non-food, consumer electronics, and apparel) are extracted from Eurostat. Regarding adequate search keyword queries to match the various economic series, we rely upon other published works. This also provides a good basis of comparison with other countries. The generic series are described in Table 1.

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4   For background information, see Wikipedia at URL: http://en.wikipedia.org/wiki/Phillips_curve
5   Data available at http://www.rva.be/Frames/frameset.aspx?Path=D_stat/&Items=1&Language=FR

Table 1: Google keyword series

Macro-variable	Scope	Google categories used
Retail spending	Retail trade services, except motor vehicles	*All categories> Shopping*
Food retailing	Retail trade services of fruit, vegetables, meat, and other foods	*All categories> Shopping> Food & Drink> Food Retailers*
Non-food retailing	Retail trade services outside motor vehicles and food retailing	*All categories> Shopping> Luxury> Mass Merchants and Department Stores*
Apparel	Retail trade services of textile, clothing, and footwear	*All categories> Apparel*
Consumer electronics	Computer and communication services	*All categories> Computer and quipment> Consumer Electronics*
Unemployment claims	Unemployment claimants at ONEM/OESO	*All categories> Local> Jobs*

Askitas and Zimmermann (2009) use four clusters of keywords for unemployment claims, but only two groups appear to be statistically relevant in nowcasting unemployment. The first group relates to people contacting the German employment agency. The second group, composed of eight keywords, attempts to aggregate all job searches from the most popular job boards in Germany. In this paper, we use the first group only as a regressor and we also consider it relative to job searches.

Table 2.a Top search terms Belgian retail, January 2004 to April 2011

Shopping		Food retailers		Non-food retailers
Ebay	100	Auchan	100	Lidl
Kapaza	95	Carrefour	50	Maasmechelen
Colruyt	30	Aldi	50	Media Markt
Carrefour	25	Traiteur	35	Maasmechelen Village
Aldi	20	Lidl	35	Carrefour
Macro	20	Unigro	25	Banque Carrefour
openingsuren	15	Renmans	25	Makro
Lidl	15	Delhaize	20	Outlet
Schoenen	15	Slagerij	20	Blokker
Esprit	10	C1000	15	Technopolis
Collishop	10	Auchan roncq	15	Mediamarkt
La redoute	10	Supermarkt	15	H&M
Anniversaire	10	Intermarché	15	Thomann
Koopjeskrant	10	Boucherie	15	Neckerman
H&M	10	Albert Heijn	10	Carrefour entreprises
Delhaize	10	Leclerc	10	Saturn
Media Markt	10	Louvroil	10	H&M
Hallmark	10	Champion	10	Quelle
Kruidvat	10	Match	10	Folder blocker
3 suisses	5	Spar	10	Maasmechelen outlet

We rely upon research by Chamberlin (2010) into retail sales. For the complete retail series, we use the search category *"Shopping"*. The subcategories retail, food, and non-food sales indicators come from *"Food and drink"* and *"Mass merchants and department stores"*. We have attempted to nowcast apparel and consumer electronics sales via the first principal component extracted, respectively from the series of searches categorized into *"Apparel"*, *"Clothing retailers"*, and *"Clothing labels and designers"* for apparel and into *"Consumer electronics"* and *"Home video"* for consumer electronics goods.

Tables 2.a and 2.b provide the top search terms in each category for Belgium between January 2004 and April 2011, with the top search term indexed at 100.[6]

Table 2.b Top search terms Belgium, January 2004 to April 2011

Apparel		Consumer electronics		Unemployment	
Schoenen	100	I-pod	100	Unemployment	100
Esprit	90	Vandenborre	80	Claims	60
Redoute	85	Sony	70	Onem	50
La redoute	85	Tv	65	Onem unemploy.	50
Kleding	65	Dvd	55	Le chomage	45
Nike	60	Samsung	40	Allocations chomage	40
Shoes	55	Lcd	35	Unemployment Belgium	40
3 suisses	55	Panasonic	30	Fgtb	35
Lingerie	55	Philips	30	Fgtb unemployment	35
Chaussures	45	Vanden borre	30	Claims unemployment	35
Zara	45	Mp3	25	Unemploy. rate	30
Mode	40	Lecteur	25	Unemploy. benefits	30
Jeans	40	Bose	20	Csc	30
3suisses	40	I-pod touch	15	csc unemploy.	30
H&M	35	I-phone	15	Benefit unempl	25
Adidas	35	I-pod nano	15	unemployed	25
Montre	35	Pioneer	15	Total benefit	20
Guess	25	Hp	15	Unemploy. Brussels	20
abercrombie	25	PDA	15	Benefit amount	15
Torfs	25	lcd tv	15	chomage economique	15

Regarding shopping, we notice the dominance of pure e-commerce sites, such as Ebay and Kapaza. Most of the top retailer chains are also visible, with Colruyt taking a large chunk of searches (collishop is their e-commerce delivery platform). Carrefour and Lidl appear in the top 10 for search terms in all shopping, food, and non-food categories. Notice as well the importance of the domain of Maasmechelen Village in the category of luxury non-food retailers. This village situated in northern Belgium is one of nine villages created by the Value Retail company in Europe and is home to outlet boutiques of the world's leading fashion and lifestyle brands.

6   The terms are directly imported in .csv extension from Google Search from Insights results.

Some caution is called for with search category allocation, as shown in Table 2.a. For example, Google Insights includes the search terms *"Banque Carrefour"* and *"Carrefour enterprises"*, which are not related to the Carrefour retailer brand, but to a database repository of administrative matters for small and medium-sized enterprises. Consequently, we had to clear this term out of the search queries series in the analysis.

In the apparel category, as shown in Table 2.b, the top search term is product related (schoenen/chaussures or footwear/shoes in English), while top apparel brands are mail order companies such as La Redoute and 3Suisses. Zara and H&M are top brands aside from mail order companies. In the consumer electronics category, Apple's i-products emerge clearly in the top 15 of keywords searched. We also see that most terms in consumer electronics are manufacturers rather than pure retailers, with the exception of Vandenborre.

Regarding the unemployment category, we notice the importance of the two major labor unions, FGTB and CSC, in keywords searched by online users.

Results

Equations (1) and (2) are estimated on the basis of available data from the longest timeframe available—that is, from January 2004 to the first quarter of 2011. Data for unemployment claims is monthly, as is the case for total retail spending. Retail sub-categories are the exception, with data available only on a quarterly basis. Search data from Google is weekly and has been re-aggregated into monthly figures, taking the geometric mean of the data.

We report results based upon non-adjusted data. Furthermore, the lagged structure for the variables in the ECM model is the one that maximizes the ECM equation fit. It appears that a model with one lag is enough, while the best lag structure is about one-quarter *ahead* for the search queries series of all macro-indicators we have analyzed.[7] All the equations have been put in logarithm form. Therefore, coefficients in tables hereafter are to be interpreted directly as elasticity estimates. Also, for simplicity, each table presents the results after reorganizing them into the form (1) of an AR lag model in *level*.

Unemployment claims

Table 3 reports results for Belgian unemployment claims, in which the endogenous variable stands for the unemployed people registered with the national unemployment agency ONEM/OESO and searches are approximated by number of search queries around "unemployment".

The equation uses a one-month lag for unemployment and a three-month lag for both the inflation and search query series. The regression fit is strong, with the ECM model explaining 71 percent of the full variance. We see some strong hysteresis in unemployment, with deviations from equilibrium unemployment in the previous month affecting 40 percent of the current unemployment dynamics. The total effect runs out after about five months or 80 percent of the total effect in the quarter.

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7   For unemployment, the strongest monthly correlation appeared at t-4, that is one quarter ahead of unemployment data (correlation moves from 0.33 at t-1, to up to 0.42 at time t-4; then correlation weakens after this). For shopping, the strongest monthly correlation appears at t-3; for other retail subcategories, where we are limited with quarterly data, we used t-1 quarterly,- this appears to be the strongest correlation too.

Table 3: Search queries and Belgian unemployment,
Monthly January 2004 to April 2011

	Coefficients	T-statistics	P-value
Intercept	6.38	5.65	0.000
Unemployment lagged	0.39	3.53	0.001
Search query "unemployment"	0.04	1.94	0.057
Search query lagged "unemployment"	0.01	0.74	0.330
Inflation	-1.04	-2.62	0.010
Inflation lagged	0.50	1.36	0.179
Adjusted R Square		71%	
Anova Significance F		0.000	

Note: equation estimated via two-steps ECM; exact search categories in Table 1

Please note that none of the lagged variables has a statistically significant effect on unemployment dynamics. Regarding inflation, this also corroborates the idea that the Phillips curve does not hold in equilibrium. Regarding search queries, this means that these do not supply information about the equilibrium level of unemployment. In contrast, search queries in a particular month affect changes in monthly unemployment, even if this stands for a small search elasticity to unemployment of 0.04. Also, as can be expected from the Phillips curve theory, change in inflation negatively affects change in unemployment claims in a particular month with quite a strong elasticity of -1. The total effect of search, using only significant ECM estimates— that is, (0.04)/(1-0.39)—or re-estimating a more parsimonious AR model *without* lagged search (and lagged inflation), leads to a total search query elasticity of about 8 percent on unemployment dynamics.

In economic terms, the effect of search queries in nowcasting unemployment dynamics is as follows. The number of unemployed people receiving a benefit from the Belgian agency ONEM/OESO oscillated between 630,000 and 770,000 from January 2004 to early 2011—a range of 140,000 people. On the other hand, search intensity varied from 43 to 82 percent in the same period. Using the elasticity estimate, search queries evolution explains a spread of about 10,000 claimants in the month and 23,000 in the quarter. So in proportion, the spread in search accounts for about 15 percent of total unemployment spread, a figure roughly in line with the variance explained (17 percent) by a naive regression directly linking unemployment with search intensity.[8]

Retail spending indicators

Total retail shopping

Table 4 shows the results from regressing Belgian retail sales on the search "shopping" queries category. The ECM model explains 46 percent of the variance.

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8   The naive regression model has 17% R-square, and shows a contemporaneous elasticity of search
     on unemployment of 8% and one quarter lag elasticity of 10%, with all search variables statistically
     significant at 1%.

As for unemployment, search queries have only a significant short-term effect on the dynamics of monthly retail sales, with the lagged search query term not affecting the level of retail spending. The short-term search shopping elasticity estimate is in the range of 0.05, with a total effect of (0.05/(1-75 percent)= 25 percent playing out in little more than a quarter. In economic terms, search explains 16 percent of the shopping variance.

Table 4: Search queries and Belgian retail spending,
Monthly January 2004 to April 2011

	Coefficients	T-statistics	P-value
Intercept	2.14	13.85	0.000
Lagged retail sales	0.75	4.16	0.001
Search "shopping"	0.05	4.52	0.057
Search Lagged "shopping"	0.06	0.68	0.480
Adjusted R Square		0.46	
Anova Signif F		0.00	

Note: equation estimated via two-steps ECM; exact search categories in Table 1

Retail subcategories

When we examine these data thoroughly by retail subcategory, the estimation is made directly on quarterly data. We first look at non-food retail, apparel, and consumer electronics (Tables 5a and 5c). In all cases, short-term changes in search queries affect changes in all subcategory sales in the quarter, with elasticities ranging as high as from 0.7 up to 2.1 for consumer electronics.

Table 5a: Search queries and Belgian non-food retail spending,
Quarterly January 2004 to April 2011

	Coefficients	T-statistics	P-value
Intercept	0.29	1.24	0.229
Lagged retail non-food	0.86	1.72	0.067
Search "mass-merchants"	0.71	4.24	0.000
Search lagged "mass-merchants"	-0.68	0.02	0.982
Adjusted R Square		0.57	
Anova Signif F		0.00	

Note: equation estimated via two-steps ECM; exact search categories in Table 1

However, note that lagged search terms, while all non significant, are all also negative, implying that long-term effects are shrinking. Economically, we find that search queries spread explains 19 percent of non-food retail and consumer electronics, and 29 percent for apparel.

Table 5b: Search queries and retail apparel spending,
Quarterly January 2004 to April 2011

	Coefficients	T-statistics	P-value
Intercept	0.42	1.65	0.112
Lagged Apparel sales	0.79	1.22	0.121
Search "Apparel"	1.05	4.24	0.020
Search lagged "Apparel"	-0.62	-0.25	0.468
Adjusted R Square		0.23	
Anova Signif F		0.02	

Note: equation estimated via two-steps ECM; exact search categories in Table 1

Table 5c: Search queries and consumer electronics spending,
Quarterly January 2004 to April 2011

	Coefficients	T-statistics	P-value
Intercept	1.98	4.89	0.000
Lagged consumer electronics sales	0.04	5.12	0.001
Search "CE"	2.12	1.98	0.050
Search lagged "CE"	-2.02	-0.16	0.852
Adjusted R Square		0.47	
Anova Signif F		0.00	

Note: equation estimated via two-steps ECM; exact search categories in Table 1

We close with food retailing.

Results in Table 5d show that this is the best fit equation of all, with R-square of 80 percent and all variables statistically significant at less than 1 percent risk. Short-term search elasticity to changes in food retail spending is relatively high at 0.6, while search queries also affect level of food retail, with an elasticity of 0.04.

The total long-term effect of search is close to 0.8. In total economic terms, search queries spread account for 46 percent of food retail spending spread in the period analyzed.

Table 5d Search queries and food retail spending,
Quarterly January 2004 to April 2011

	Coefficients	T-statistics	P-value
Intercept	2.46	6.22	0.000
Lagged food retail	0.25	6.21	0.000
Search "food and drinks"	0.58	5.01	0.000
Search lagged "food and drinks"	0.04	5.61	0.000
Adjusted R Square		0.80	
Anova Signif F		0.00	

Note: equation estimated via two-steps ECM; exact search categories in Table 1

□   □   □

Increasingly more Internet users leverage search to guide their decisions—whether about purchasing goods and services or finding information for claims. Because these search data are available in real time, this paper has analyzed the ability of online searches to nowcast the dynamics of Belgian retail and unemployment. This paper confirms various research findings in other countries. In particular, this paper shows that the nowcasting ability is often large and statistically significant in detecting changes in macro-economic trends, but sometimes (e.g., food retailing) also in determining the level of some major economic activities. Short-term search query elasticities can also be material, sometimes above one for consumer electronics retailing. In general, search queries explain between 16 and 46 percent of all the variance in Belgian indicators analyzed.

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Impact of TMT

Articles in this section

Winning the Web standards battle

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The web witnesses a continued set of battles to impose standards. HTML5 typifies such a battle. But watch out—history tells us that the better platform doesn't always win.

Dr. Jacques Bughin

HTML5 offers many advantages, from a better video experience to easy access to programs when users are offline. However, history tells us that the better platform doesn't always win. Consider how Betamax floundered during early efforts to set a standard for home videos, even though it was widely considered to be better technically than its rival, VHS.

The critical issue in platform competition is whether a new technology can create a vibrant ecosystem of large and small players. In the case of HTML5, this means providing an environment that not only enables a better user experience but also makes it possible for innovative new Web programs to scale rapidly, and for industry players to gain significant benefits. Web companies that rely on advertising revenues, for example, may want to use HTML5 to help expand their reach, making mobile devices and even TV screens frictionless portals to the Web. Apple and Nokia would want the new platform to enhance the user experience in ways that stimulate sales of their smartphones and tablets.

Recent research on standards-based competition highlights four issues (unrelated to the consumer experience), that will help determine the platform of the future.[1] Executives should keep a careful watch on them to find out whether HTML5 will reach its potential, or be stymied by the difficulties that sometimes block the progress of new standards.

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[1] See, among other sources, Carliss Y. Baldwin and C. Jason Woodard, "The architecture of platforms: A unified view", *Harvard Business School working paper,* Number 09-034, September 2008; Martin Kenny and Bryan Pon, "Structuring the smartphone mobile industry: Is the mobile Internet OS platform the key?", ETLA working paper, Number 1238, February 2011; and Michael Cusumano, "Technology strategy and management: The puzzle of Apple", *Communications of the ACM*, 2008, Volume 51, Number 9, pp. 22–24.

What developers do

A winning platform needs to capture the hearts and minds of the best developers. HTML5's flexibility should be a strong selling point for many, but sheer numbers aren't enough. To create compelling value a platform must also encourage collaboration among talented programmers and content developers. This leads to greater innovation and to applications that excite a critical mass of new users.

The preferences and goals of developers will also affect the pace of change. Some may be quite satisfied with the returns they currently get from the app stores. For others the allure of wider reaching, multiscreen access, and—potentially—a more significant distribution and marketing platform, could make HTML5's open standard more attractive.

How the economics evolve

The actions of developers and companies will reflect the economics of paid applications and advertising. Apple, through its App Store, has demonstrated that the paid mobile-content model can succeed. It's also clear that as smartphones have improved mobile phone advertising has finally taken off. Mobile Web search now spins out revenues from paid keyword advertising, in much the same way as the PC-based Web does. Still, analysts remain uncertain about which of these two models will gain ascendancy. How much will customers be willing to pay for apps? (If demand for paid apps hits a wall as users resist paying for specialized, "long-tail" programs—which don't have mass appeal but seek to attract niche users beyond the first wave of hits—that would be a boon for HTML5.) Will advertising revenues grow in line with rising numbers of mobile users? If not, Web-based HTML5 applications might be less attractive for developers than apps they can charge for.

The answers to such questions will determine whether the mobile Web ultimately looks more like today's PC-based market (advertising and paid content are approximately equal in importance), or today's mobile-Internet market (paid-content revenues are more significant). They will also have major second-order effects: if the economics start tilting one way or the other, developers will probably steer increasingly more of their innovative efforts toward the winner—paid applications or advertising-supported content. A similar virtuous cycle could affect the decisions of advertisers, whose returns on mobile digital-marketing investments will increase along with the size of the audience consuming ad-supported content.

How platforms fare

At present, the mission of Google's Android platform may simply be to become a broadly accepted mobile-Web operating system that ensures the successful transition of Google's core search business to smartphones. An open-source model can help maximize reach, with revenue coming not from traditional licensing deals but from alternative sources such as mobile advertising. But what if ad growth hovers below expected targets? Similarly, if the mobile environment becomes more open—more like today's PC-based Internet—will Apple and others continue to nurture their walled-garden operating platforms?

How the technical issues play out

When hardware and software producers, as well as service providers, can easily incorporate elements of a platform, momentum for the standard increases. Interfaces—the specifications that allow diverse systems and hardware to interact readily—are often the key. In the PC world, a powerful impetus toward standardization was BIOS, which provides rules for how Intel processors handle instructions from software programs and communicate with other components and devices. On today's mobile battlefield, complexity reigns. Apple's mobile interface ties the iPhone's operating system to custom-built processors. Android and Windows Mobile systems interface with chips designed by Intel, Qualcomm, and Samsung. While this fragmentation could slow down HTML5's adoption, it could also set up a healthy competition for a faster, more robust HTML5 interface that will enhance the standard, leading to greater innovation and, ultimately, to higher sales of chips.

The wisdom of the Web: How good is your telecom brand?

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The Internet has become a major big data laboratory of what consumers search
for, comment upon, and purchase from different brands. But is all this pure noise,
or rather, a reflection of collective wisdom of brands? Perhaps the latter—if one
believes how a mash-up of online searches and of social media (Twitter, Facebook,
and others) accurately "nowcasts" the sales performance of telecommunication
companies in Belgium in the last 12 months.

Dr. Jacques Bughin

"It's tough to make predictions, especially about the future"[1]

With billions of users connected to the Web, the Internet has become a crucial platform
where we can observe myriads of user behavior in real time. This is quite a unique feature
for statistical analysis, and it is being used by numerous authors to "nowcast" many
phenomena—from consumer sales (travel, automotive, and movies) to unemployment and
the spread of influenza (Ginsberg et al. (2009), Choi and Varian (2009), etc).

This paper follows the same line of research and assesses how online "traces" in the form
of both searches and social buzz correlate with the performance of companies. We believe
there are three features that make this study unique. To begin with, it is the first paper
that combines both online sources of social media and search with the aim to assess
their joint ability to nowcast company performance. Second, this article deals with a
new industry case study, the telecoms industry (in Belgium). Third, it assesses how the
combination of buzzes and branded searches could correlate with a telecom company's
sales performance.[2]

The research results are as follows. Branded search queries and social buzz are two, as
yet imperfectly correlated, dimensions of a company brand. Their conjunction explains
(on average) up to one-third of variance in company product sales performance, with
searches explaining an order of magnitude more than buzz alone. Search and social
buzz elasticities to fluctuations in company product sales are, in most cases, statistically
significant, with (on average) a 10 percent increase in search query intensity directly
boosting variation in product sales by about 2-3 percent and up to 4-5 percent for social
buzz regarding the triple-play products analyzed in this paper.

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1   Yogi Berra, as quoted by Choi and Varian (2009).
2   It is well known that a statistically valid ECM is equivalent to a Granger causality model from the lagged
    weakly exogenous variables—in our case, comments valence and online search intensity (see Engle and
    Granger, (1987).

All in all, this research confirms the nowcasting potential of online data as "markers" of economic performance. It also shows that social media as well as online searches are powerful indicators combined of nowcasting.

Background and methodology

Literature review

There is a plethora of blogs and papers trying to make the case that social buzz and searches can be correlated with company performance. Regarding social media, anecdotes are omnipresent, e.g., Domino's Pizza once claiming that most of its UK sales increase in 2010 resulted from its social media prowess.[3] More formally, marketing research has long highlighted a clear-cut correlation between online comments ("word of mouse") and sales—however, this effect relies upon a restrictive set of experienced goods, such as books sold on Amazon (Chevalier and Mayzlin, 2006) or movie sales (Duana et al., 2008). Recent finance research goes one step further. For example, Bollen et al. (2010) investigated how microblogs and tweets can be useful information to predict stock market performance of companies. In particular, the seminal paper by Bollen and colleagues reveals that Twitter sentiments could predict the direction of the Dow Jones with 87 percent accuracy.

In parallel with social media research, other authors have focused on how online searches can be used as relevant performance indicators. Choi and Varian (2009) were among the first to leverage the billions of online searches on Google to demonstrate the high forecast-ability of various US retail categories, such as car sales or travel online. Schmidt and Vosen (2011), using factor analysis on multiple consumer search categories to build an index of retail search, demonstrated that their index was outperforming key survey-based indicator standards, such as the University of Michigan Consumer Sentiment Index and the Conference Board Consumer Confidence Index. Wu and Brynjolfsson (2009) confirm that Google searches can be a good nowcasting indicator of the US housing markets. Similar results can be seen in other countries. Carrière-Swallow and Labbé (2010) successfully managed to nowcast car sales in Chile, while Bughin (2011), Askitas and Zimmermann (2009), and Suhoy (2009) used online searches to better forecast unemployment in a variety of countries, such as Israel, Germany, and Belgium.

Surprisingly, until now no research has applied social media and search indicators jointly to correlate them with performance. This paper attempts to do this and specifically use public data mash-ups from both *Socialmention.com* and *Google Insights for Search,* two analytic platforms with summary statistics on social buzz and online users' search behavior. Google describes the search query share is a ratio of the number of searches for a particular search term relative to the total number of searches during a specified time period. For indexing purposes, the Google search data are rescaled between (0-100). The lower bound is defined by the initial time period query share value and the higher bound corresponds to the heaviest searched term during the specified time period. Taking different branded (in our case telecom company brands) search queries for the same time period, Google search query index indicates the relative (indexed) probability that any user will perform a web search related to the brand under analysis.

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3   "Can social media boost pizza sales? Domino's tells investors, 'Yes!'", at URL: http://socialmediainfluence. com/2010/07/14/can-social-media-boost-pizza-sales-dominos-tells-investors-yes/

Socialmention.com is a meta-social search engine,[4] which aggregates all forms of comments made on news sites such as *Yahoo news*, blogs such as *Google blogspot*, microblogs such as *Twitter*, or social networks such as *Facebook*. Furthermore, it uses algorithmic sentiment analysis to determine the type of mood on comments—in particular, for each time period, a sentiment valence intensity can be constructed that shows the relative sentiment generated by a company in a defined time period.

Statistically, the two search platforms capture a dominant share of most social and web queries. Web searches through Google account for about 77 percent of the total branded searches for the Belgian telecoms brands. Regarding social buzz, 37 percent originates from the most used social sites in Belgium, that is Twitter, 14 percent from Facebook, 8 percent from YouTube. The balance comes from about 20 other sites.

Scope and methodology

The scope of this article is to test, via regression techniques, the ability of search and social buzz to nowcast the triple-play sales performance of telecoms companies.

The ECM model

Most of the recent search nowcasting literature has used simple auto-regressive models, augmented by search queries as an extra term variable to see how search evolution could add explanatory power beyond simple auto-regressive models. Azur and Huberman (2010) use an auto-regressive model to assess social media impact on movie sales. We follow the literature in defining a model of the form:

$$Y_t = a + b.Y_{t-i} + c.SB_t + d.SB_{t-i} + e.S_t + f.S_{t-i} \tag{1}$$

Or in traditional, ECM form:

$$Y_t - Y_{t-i} = a' + c.(SB_t - SB_{t-i}) + (b-1).Y_{t-i} + (c+d).SB_{t-i} + e.(S_t - S_{t-i}) + (e+f).S_{t-i} \tag{2}$$

Where $t=0...13$ is monthly data from June 2010-2011, Y is the performance series we aim to nowcast, S and SB are, respectively, the search query index extracted from *Google Insights for Search* and of social mentions valence intensity computed from *SocialMention.com*, at time *t* and *t-i* and the coefficients vector (a, b, c, d, e, f) are coefficients to be estimated.

The model uses the two-step regression method of Engle and Granger (1987) for non-stationary data. From (2), also, c and e measure the short-term impact of social buzz and of searches on the change in Y. The values $(c+d)/(1-b)$ and $(e+f)/(1-b)$ provide an estimate of the complete effect of social buzz and search contributions on Y.

Data: the performance variable

The performance variable, Y, is the monthly sales conversion rate achieved by the top telecoms brands in Belgium. Specifically, the sales conversion rate is computed as the gross sales achieved during the period divided by the amount of users churning in the previous month and those yet to buy the product access. Data have been collected via monthly polls and cross-checked to the extent possible with operators. The regression has been done for each product of the triple play: Internet broadband access, digital television basic package access, and fixed telephony lines. We consider the top three fixed-access brands, that is, the Belgian telecoms incumbent Belgacom, covering

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4   For a list of top social search engines, see http://www.futurelab.net/blogs/marketing-strategy-
     innovation/2011/04/free_social_media_monitoring_t.html

virtually the entire country, and the two main regional cable MSOs, Telenet in Flanders (with a footprint of about 55 percent of the population) and Voo-Tecteo in Wallonia (roughly 42 percent of total population coverage).

Table 1 provides a summary of the current Belgian market share in number of access lines as of Q1: 2011.[5] For clarity, it also includes the data for Mobistar, the second mobile telephony operator. We note the leadership of Telenet for both Internet access and digital television, despite 55 percent population coverage. Also, Telenet recently launched an MVNO with Mobistar wholesale, while Mobistar recently launched its diversification to fixed lines only.

Voo revamped its strategy in 2008 and accordingly, launched its digital television product platform roughly two years ago, while it upgraded its Internet access product with DOCSIS 3.0 one year ago. Belgacom remains dominant in terms of fixed lines and mobile access via its Proximus brand. It is also a real contender in Internet broadband in Belgium. Likewise, its market share of digital TV, through its IPTV platform, is one of the largest in Europe.

Table 1: Market share quad-play in Belgium, Q1: 2011

Telco Brands	Telephony Fixed lines	Internet Broadband	Digital Television	Telephony Mobile subs
Mobistar	5%	2%	1%	47%
Belgacom	64%	45%	37%	50%
Telenet	26%	46%	52%	3%
Voo	5%	7%	10%	0%

Note: sources are own market research and public sources

Data: the online indicator variables

The online search query series originate from categories in *Google Insights for Search*. For example, we use Google subcategories, *"telecommunications"*, then *"service providers"*, then *"ISP"* for Internet access searches, and *"VOIP/Internet telephony"* and *"phone service providers"* for fixed telephony access search queries. For digital television, we use *"entertainment"*, then *"TV"*.

As an illustration, Table 2 shows the top 10 search queries in *Google Insights for Search "All categories"* for the top three brands in the last two years (June 2009-June 2011). As part of the *"All categories"* searches, the table allows for aggregation of searches besides access, such as Belgacom Skynet (portal services) or Voo BeTV (premium pay-TV bouquet services). Please bear in mind that by construct, search queries are computed relative to starting date, in this case to search query figures of two years ago.

As already mentioned, the top search term during the time period is indexed on 100, with zero as the lower bound for all terms, in June 2009. This table reveals some interesting facts. First, as expected, fixed telephony never came up in the top 10 keyword search terms for any of the top three fixed telecoms brands (in fact, the product penetration is not increasing but declining). Second, the telecoms incumbent, Belgacom (and the Scarlet brand in Wallonia) comes as a major overlapping search for

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5   We aggregate all brands linked to those operators for access—e.g., Belgacom has Scarlet as second low cost brand for Internet access. It still has Skynet as branded portal/ISP service too. Also, Telenet has launched Yelo, its multi-screen video services.

both Telenet and Voo, highlighting stronger comparison between brands since June 2009. In the last two years, there have been relatively more searches for Belgacom's IPTV product, than for its Internet access, showing the momentum of IPTV. The product has been provided for free as part of Belgacom's Internet offering and has been the subject of heavy marketing campaigns and product upgrades in the last two years. Regarding cable, more and more search queries for Telenet relate to telemetry and access speed, and Internet is also the top search query for Voo compared to two years ago. This illustrates momentum for cable Internet in both regions of Belgium.

Table 2: Top search queries, Belgian fixed telecoms brands, June 2009-June 2011[6]

Telenet	Searches	Belgacom	Searches	Voo-Tectoe	Searches
mijn telenet	100	Belgacom tv	100	voo Internet	100
client services telenet	45	Internet belgacom	25	scarlet	60
Belgacom	35	Telenet	20	voo tv	55
telenet speedtest	35	Klantendienst belgacom	20	belgacom Internet	50
Speedtest	30	Adsl	15	adsl voo	50
telenet tv	25	adsl belgacom	15	Adsl	45
digicorder telenet	20	skynet belgacom	15	voo belgique	35
telenet telemeter	20	Skynet	15	Internet belgique	20
Telemeter	20	belgacom e-services	10	belgacom adsl	20
telenet.be	15	webmail belgacom	10	BeTV	10

The construct of the social buzz variables is still open-ended. Works by Bughin et al. (2010) make the case that buzz volume per se is not a strong performance forecaster, but that volume must be adjusted for valence, which is the volume that generates significant sentiments. Asur and Huberman (2010) confirm this by showing that sentiments extracted from Twitter improve the extent to which tweet rates can predict movie revenue. Davis and Khazanchi (2008) show as well that contrary to valence, review comments volume alone has no effect on multi-category e-commerce sales. Accordingly, this article uses the total buzz valence as extracted from *Socialmention. com*. Furthermore, based on the regression fit, we have used only positive valence in this article. In practice, the buzz valence has been computed from the intersection of two keywords in the search box of *Socialmention.com* that is, the related company brand, intersected with the related product (digital TV, fixed telephony, and Internet).

Table 3 provides some key statistics for the month of June 2011 regarding the top three fixed telecommunication brands, in aggregate. Telenet receives the largest mention and about 20 percent of mentions contain some sentiments, either positive or negative, in line with other works (Jansen et al., 2009). Polarity is about 4:1, that is, comments regarding telecoms brands express positive sentiments four times more often than

6   The terms are directly extracted from Google search and orthograph can thus be approximative.

negative sentiments. Notice that Telenet has less positive valence. Digging into the various comments, the amount of negative comments in June 2011 was related to actions of the company to limit P2P traffic on its high-end Internet access product.

Finally, the last two columns of Table 3 provide an indication of the virality of social buzz, for example, the re-tweet rate measures the proportion of tweets forwarded by other users, while the last column is an index of the average reach of each mention during the month of June 2011 for the Belgian telecoms brands. Voo enjoys the largest reach and also enjoys a re-tweet rate close to that of its Flemish cable counterpart, Telenet.

Table 3: Social buzz, June 2011, Belgian fixed telecoms brands

Telecom Brands	Mentions Share	Mentions With sentiments	Valence Polarity	Re-tweet Rate	Average Mention reach
Telenet	46%	18%	213%	20%	0.89
Belgacom	36%	22%	467%	15%	0.74
Voo	8%	15%	400%	19%	1.55

Note: valence polarity is the positive/negative sentiment ratio. Mention reach is the index of average mention reach in the market.

Results

First experiments

We started by making a few analyses to better grasp the available data. First, we looked at the basic time-series correlation between searches/social mentions and product performance. In general, the contemporaneous correlation between brand search queries and product sales varies between 0.3 and 0.55—with the correlation increasing between 0.45-0.7 if search queries are taken two months in advance of sales. The correlation with social mention valence intensity was about 0.25-0.45, but did not increase with lags. Second, we assessed the correlation between brand search intensity and brand search valence: this correlation was found to be positive, at 0.6.

These experiments already suggest three things. They confirm the presence of a strong link between online searches and social buzz on the one hand and telecoms sales performance on the other. Given the time lag, it also suggests that the online data are a leading indicator and not necessarily a consequence of future sales (Azur and Haberman, 2010). Finally, it shows that while relatively highly correlated, social mentions and searches have their own useful information to help predict telecoms product sales.

Complete multivariate results

Equations (1)-(2) are estimated on the basis of monthly data (June 2010-June 2011) for the top three telecoms companies. We report results based on non-adjusted data. The structure for the variables in the ECM is a two-month lag *(t-i= t-2)*; this maximizes the regression fit and matches the pattern of the most important univariate correlations described earlier. The data for Belgacom is split between Flanders and Wallonia, so we have four regional brands. The unobservable fixed effects of brands cancel out by estimating the ECM model (first-time difference). In total, we have (13-2) months *four regional brands* = 44 data points and five regressors.

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Given the high correlation between search queries and social buzz, we need to minimize risks of multicollinearity in the regressor. We thus have initial regressed social buzz on search. The residual of the regression is the new search variable, which is orthogonal to social buzz and is entered into the multivariate ECM regression.[7] All the equations have been put in logarithm form. This way, the coefficients are to be interpreted directly as elasticity estimates. Also, for the sake of simplicity, each table presents the results after reorganizing them into the form (1) of an auto-regressive lag model in *level*. We report the results in Tables 4a-4c.

Table 4.a demonstrates that brand Internet sales exhibit an auto-regressive pattern, with a 10 percent increase in previous company sales affecting 5.2 percent of current monthly sales. However, search query and social buzz add significantly to nowcast Internet performance. First, marginal R-square contributions are large, that is, 21 percent of variance for search on a total of 71 percent (explaining 30 percent of total variance) and 10 percent of variance (explaining about 15 percent of total variance) for social buzz. Also, coefficients are significantly correlated with Internet brand performance, with search elasticity to changes in Internet sales of 0.2, but as high as 0.5 for social buzz. Both lagged variables are statistically not significant, however, implying no long-term equilibrium between searches/buzz and Internet performance sales in the data.

Table 4a: Online buzz and search as predictor of Internet brand performance, Belgian telecoms, June 2010-June 2011

	Coefficients	T-statistics	P-value
Intercept	1.62	1.56	0.161
Internet sales lagged	0.40	3.33	0.001
Search query "ISP"	0.20	2.67	0.004
Search Query "ISP" lagged	0.03	0.74	0.330
Social buzz "ISP"	0.51	3.03	0.001
Social buzz "ISP" lagged	0.11	0.60	0.001
Adjusted R Square		71%	
Delta R Square search queries		21%	
Delta R-square buzz		10%	
Anova Significance F		0.000	

Note: equation estimated via two-step ECM; buzz is positive valence only; search is residual search from regressing buzz valence on search queries

Table 4.b illustrates the results regarding digital TV sales performance. As for Internet sales, a strong auto-regressive pattern prevails, with 10 percent increase in previous company sales affecting 5 percent of current monthly sales. Also, search query and social buzz add significantly to nowcast digital TV performance with online search explaining 26 percent of variance (explaining about 35 percent of total variance) and 11 percent of variance for social buzz. Equivalent with Internet, search elasticity to change in digital TV sales is significantly higher for social buzz than for search queries, respectively, 0.25 and 0.40. Furthermore, lagged social buzz is correlated with digital

7   The regression between social mention valence and search queries was also done in log form. The social mention elasticity to search was found to be 0.8, and statistically different from 0 and 1. The adjusted R2 was 0.44.

TV performance; using the parameters, the complete long-term buzz elasticity is
(0.41-0.11)/(1-0.48)= up to 0.6.

Table 4b: Online buzz and search as predictor of digital TV brand performance,
Belgian telecoms, June 2010-June 2011

	Coefficients	T-statistics	P-value
Intercept	0.64	2.16	0.036
TV sales lagged	0.48	3.18	0.001
Search query "TV"	0.25	2.05	0.045
Search Query "TV" lagged	-0.16	-0.74	0.330
Social buzz "TV"	0.41	2.18	0.040
Social buzz "TV" lagged	-0.11	1.99	0.049
Adjusted R Square		77%	
Delta R Square search queries		26%	
Delta R-square buzz		11%	
Anova Significance F		0.000	

Note: equation estimated via two-step ECM; buzz is positive valence only; search is
residual search from regressing buzz valence on search queries

Table 4.c concerns the sales of telephony. Here again, we see a strong auto-regressive
pattern in sales and online markers are found to be indicators of brand performance,
but the nature of contribution contrasts with those of Internet access and digital TV.

Table 4c: Online buzz and search as predictor of fixed telephony brand performance,
Belgian telecoms, June 2010-June 2011

	Coefficients	T-statistics	P-value
Intercept	0.14	0.16	0.865
Telephony sales lagged	0.70	4.78	0.000
Search query "VOIP and telephony providers"	0.30	2.01	0.048
Search Query "VOIP and telephony providers" lagged	0.20	3.11	0.001
Social buzz "VOIP and telephony"	0.06	0.97	0.367
Social buzz "VOIP and telephony" lagged	-0.05	-0.44	0.762
Adjusted R Square		64%	
Delta R Square search queries		17%	
Delta R-square buzz		3%	
Anova Significance F		0.000	

Note: equation estimated via two-step ECM; buzz is positive valence only; search is
residual search from regressing buzz valence on search queries

Social buzz is not statistically significant, in contrast to searches; further social buzz elasticity estimates were found to be relatively low. Online search elasticities are affecting both the short-term changes in telephony sales and the structural level of telephony sales; further long-term elasticity is relatively large (0.3+0.2)/(1-0.7)=1.6.

☐   ☐   ☐

In this paper we have assessed the relevance of Internet searches and social buzz as indicators of telecoms sales performance. The univariate correlation analysis suggests that both searches and buzz have significant nowcasting ability, which is confirmed in a more sophisticated multivariate ECM setting. While there is a strong auto-regressive pattern in monthly sales for each product (Internet access, digital TV, and telephony), searches and social buzz valence add up to a non-trivial 20 percent (telephony) to 37 percent (digital TV) of product sales variance. Among other results, searches contribute the most to this variance explained, but social buzz has more elasticites to changes in sales than do searches.

All in all, this paper confirms the value of Internet data as a nowcast performance indicator. It adds a new sector (the telecoms industry) to the piling evidence; and also suggests that searches and social media are useful online data for jointly predicting sales.

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Expecting the unexpected: Ten twists to shape your TMT strategy

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Advancing technologies are radically altering existing business models and strategies. McKinsey has identified ten trends that TEM players need to incorporate into their strategic thinking.

Dr. Jacques Bughin and Markus Frerker

From social media and connected TV to mobile app stores and e-readers, digital media has permeated the very fiber of the consumer lifestyle. This technology is obviously here to stay, but some of its associated trends are just as surprising as they are powerful.

One indicator of the importance of digital media in the consumer's life is the degree to which the average user's language has incorporated this technological phenomenon. The digital lexicon used to be reserved for industry insiders with terms like "long-term evolution" and "fiber to the home." Today, "tweet" and "text" are uttered more frequently than "call," and "Google" is a verb. The digital revolution has arrived, but how do players in this realm turn trends into action? This article offers ten glimpses into the future of media in ways that aren't typically predicted—balancing the noise of exciting trends with ongoing research and some historical lessons.

1. Rich media's true focus is at home

The current focus of the industry is on the rise of new connected and mobile devices that can port media in and outside the home. The iPod was the first clear development in this direction, followed by the Kindle for books and now multimedia e-tablets like the iPad, accompanied by the surge in smartphones. But one key factor has gone unnoticed. Eli Noam, Professor of Finance and Economics at Columbia Business School and Director of the Columbia Institute for Tele-Information, has pointed out that the bit price paid per minute of use for in-house media has remained relatively flat across the years: approximately 0.1 US cents per second or around USD 3.60 per hour. When a technology is priced below that flat rate, it is consumed in the home; when above, it is consumed in shared environments until it becomes more affordable.

Moore's law, however, is that compression technologies—especially under Internet protocol—allow the delivery of 30 percent more bits at the same cost for every year that passes. This means that an ever richer media experience (measured by bits per second) is becoming accessible for home consumption at an exponential rate. Even now, most rich media—even on connected devices—is consumed at home.

Key takeaway: Despite the adoption of connected on-the-go devices, the home will remain a growing center of media entertainment, revenue, and consumption.

2. Media brands continue to concentrate

In traditional media, tension has always existed between distribution and content. Usually, who was king depended on the relative size and competition of either part of the value chain. The online world has altered the balance of the value chain. Industry players understand the speed at which new Internet giants, from Google to Twitter, have emerged as global companies. They are less aware of how quickly Internet markets are concentrating the new media brands—much greater than levels that normally prevailed in the traditional media and content industries.

Traditional media industry concentration has remained relatively flat, at levels deemed low in the film and broadcasting industries for antitrust reasons. Concentration of the Internet economy's new media sector, however, has been doubling every five years, to the point where global new media companies are quickly reaching the same level of concentration as local Internet last-mile infrastructure players.

Looking specifically at global IP traffic data, Akamai reports that the Internet traffic generated by the top 100 brands has doubled in less than three years and that companies such as Google (with YouTube) have emerged in the last three years as one of the top generators of traffic on the cloud. The same is true even if you take a local market-by-market perspective: the level of traffic and revenues is always more concentrated than in traditional media.

Key takeaway: Online media brands will continue to concentrate, creating a new balance between content and distribution. Traditional media will need to figure out how they wish to play in this new equation.

3. Long live TV!

The innovations in the consumer electronics, distribution, and other technology industries offering new over-the-top (OTT) devices and services confirm the huge interest in targeting the video market. The impending changes from non-linear usage, long-tail offerings, and entirely new ways of accessing content (searching for and obtaining social recommendations directly via smart TV, for example) are multiple. They include the likely concentration on top TV shows and fragmentation of other content, and the lower effectiveness of horizontal and vertical programming. Nevertheless, television still has a long life ahead.

The latest figures for many markets show TV viewing still growing as new services such as video on demand or time shift viewing increase the pie, encouraging additional usage as well as further revenue streams. 2010 saw the highest TV viewing times ever in some countries: in Germany, figures were 223 minutes per day on average, up around 11 minutes compared with 2009.

Television has also largely defended its share in advertising markets, with the growth of online coming primarily at the expense of print media. Online and television have so far benefited most from marketers raising their budgets, while print media will most likely see another modest decrease in 2010. The evolution of video online to video on TV will likely be accompanied by a further transfer of online-rich media to the TV screen. This development will also be responsible for introducing new sources of revenue such as TV commerce, online TV search functions, or simply better-targeted and personalized TV ads.

Live television may become stronger as a result of nonlinear television evolution. Consumers are particularly interested in live sports and reality shows/soaps and other series, but show little interest in consuming these after the outcome is already known. Time shift offerings thus have limited substitutional appeal for this type of entertainment.

Key takeaway: TV access and consumption will likely change, but television will remain the center of gravity for the consumer at home.

4. Hype follows the Concorde

While online media consumption and online display advertising will doubtless continue to see substantial growth, it remains a difficult world. Digital efficiency is under constant scrutiny, especially where non-premium content is concerned. Marketers are increasingly moving away from the CPM (cost per thousand impressions) model toward cost-per-click and other performancebased pricing models. Pricing is also under pressure. During the crisis—and to some extent even before that—CPMs saw a decline driven by overcapacity on the market and new sales models (the emergence of large advertising networks, online advertising exchanges, etc.).

The rise of Web 2.0 has brought many new offerings, ranging from user-generated content led by YouTube, virtual worlds like Second Life, and social communities (originating with MySpace). All of these, at least initially, attracted large user bases and generated much hype. Many copies emerged around the world. Despite the rise in both offerings and usage, the underlying business model often remained a major struggle. Many players had to learn the hard way that traffic alone is a necessary but far from sufficient requirement to support a profitable business model.

Some former stars have already fallen from the sky. More than 20 million users registered for a Second Life account after its launch, but no more than 789,000 logged in per month (on average) during Q3 2010. MySpace is no longer hitting the headlines with new usage records either, but instead with its staff layoffs and potential disposals. Prospects for some of the formerly hyped new Internet offerings are as dismal as those of the Concorde. The first commercial supersonic aircraft never achieved a sustainable business model with enough users showing sufficient willingness to support its operational costs. A business model that not only attracts usage but also creates a profitable ecosystem that sustains sufficient revenues—whether from advertising, paid content, or other sources such as commerce—represents a key success factor for any new business to last.

Google has shown the way by offering a search utility to users and powerful direct marketing click-through rates to advertisers. Couponing may epitomize a new trend of this kind, best represented by Groupon. Users benefit from coupons, while companies sell more of their goods. Even Facebook is not just driving up its user base: a major part of its focus now is to have emerging local sales teams monetize its large user base via its social graph.

Key takeaway: Hype always comes to an end. Successful online models will be those that swiftly anchor a sustainable revenue platform.

5. Free alternatives continue to impair paywalls

Results of the McKinsey newsroom barometer at the 2010 World Editors Forum revealed that 47 percent of respondents think most news on the Internet will cease to be free in the future. Uncertainty about how to monetize Internet content is still rife, however. Various models are predicted, ranging from user-paid content on subscription and pay-per-download models through to licensing and advertising. The latter covers different forms, too, including display, rich media, and sponsorship. But the introduction of paywalls has often decreased reach and usage dramatically. The introduction of a paywall for the online version of the UK's leading Times and Sunday Times newspapers has decreased their user buys by two-thirds, with 58 percent refusing to register despite a price much below common print prices—GBP 1 per day or GBP 2 per week.

Paid online content is not just a hot topic for the print media and its associated Web sites. Given the cyclicality of advertising markets, this has become a strategic question for other businesses, too. It also reflects the fact that it is increasingly hard, particularly for focused offerings, to reach critical audience size and remain relevant for marketers. Leading music TV player MTV Germany, for example, announced that it was ceasing free-to-air (FTA) broadcasting in October 2010 and instead moving into basic pay-TV bouquets as of January 2011. Leading European FTA players such as Mediaset, RTL Group, or ProSiebenSat.1 Media AG have expanded—or announced aspirations to expand—their presence in pay-TV to capture new revenue streams and reduce their dependence on cyclical advertising markets.

With any of these ventures, however, one needs to remember the famous quote of NBC's Jeff Zucker on "turning analog dollars into digital dimes." Paid content revenues deteriorate if the prices of online offerings do not match physical copy prices. Advertising revenues are similarly jeopardized if reach and/or CPMs of the online offering are below those of traditional ones.

Key takeaway: Whatever the revenue model for content, the only winners will be those able to generate enough price and volume power.

6. Hidden face of social networks will come to the fore

Social networks are everywhere: their sheer size is already altering the way people interact on the Web. The lead site Facebook claims to now have over 500 million active users, bypassing Google as the most frequented site on the Internet. 50 percent of its users log in on any given day, spending a total of 700 billion minutes per month on the site. This means Facebook users spend more than an hour per day logged in to the site—equivalent to the time they spend watching their favorite TV channel each day. Users also claim around 130 friends each on average.

These are all impressive figures, but what do they hide? It is hard to believe that people are actively in communication with each other for over an hour a day, on top of phone calls, texting, e-mail, and instant messaging. Something unnoticed must account for most of the time spent on social networks. The dominant activity on social networks is actually "silent"—browsing other people's pages. Depending on the site, browsing as a share of total time spent varies between 50 percent on LinkedIn to up to 85 percent on MySpace.

The visible interactions are very skewed, with a highly interactive portion of the user base—30 percent—accounting for most of such interactions. The social "underground" is very different. Underground browsing interactions are rampant across the entire population of social networks, with around 90 percent of users contributing. Users in this sphere are also less inclined to feel the need to reciprocate visits. Visits by

nonfriends—a major measure of likely influence—make up a significant portion of views of most user profiles. All of this means that the social underground is much more diverse—and likely more powerful—than the active, visible social activities on Facebook and other sites would lead us to believe.

Key takeaway: Expect this underground—which cannot be deduced from trawling publicly available data—to come to light and reinforce the social nature of the Internet.

7. From reach to social structure

Social media is everywhere, from tweets to Facebook messages. But social structure is just as important. Someone sending a message to friends who do not care or to direct contacts who themselves have little to relay to other friends means the social message will die out very quickly. The key here is the social structure: how social media operate in networks structured to maximize the fastest and broadest cascades among social groups. Fashion goods usually create a buzz in very broad networks, while community products have a hard time spreading outside their niche.

Media companies should try to sell the value of their social structure on top of basic reach. Advertisers are starting to get interested. Some companies are now leveraging the social structure of their customers, for example, to boost the performance accuracy of their sales forecast model. Others, such as telcos, are mapping churners in the social vicinity of a customer using call patterns or social interactions on Web sites to better predict the fragility of their own customer base—sometimes with great success. Models based on social networks demonstrate that mobile subscription churn predictions can sometimes be improved by up to 300 percent.

Key takeaway: Social media will soon add social structure as a key enabler of its media relevance.

8. Digital marketing set to pole vault

Digital marketing continues to grow at roughly double digits per year, fueled by new formats (rich media), new digital platforms (mobile), and the constant growth in Internet connections and usage. Forecasts are that digital spending will continue to grow, but our predictions suggest it will quickly leap to an even higher figure due to the conjunction of multiple tipping points:

- In many countries, the daily reach of home broadband has exceeded 70 percent of the population—a threshold at which advertisers are increasingly comfortable reallocating budget to new media.

- The return on investment (ROI) of digital advertising is becoming widely known as an unbeatable proposition. Estimates of advertising campaign value are now being released publicly by lead information and measurement companies such as Nielsen, demonstrating that the ROI online is likely to be at least 100 percent. Hal Varian, chief economist at Google and a top US economist, also presented results at the American Economic Association showing that the ROI of sponsored searches yields minimum revenues of two euros for every euro spent.

- Companies are increasingly realizing that even if customers do not buy online, a vast majority research online and purchase offline (ROPO), whether via social network messages, access to their brand's Web site, or key word brand and product searches. This ROPO effect is huge—usually as large as if not larger than the share of retail commerce performed online.

Key takeaway: Digital platforms—both traditional and new—are creating a unique occasion to corner the consumer and associate a targeted message. Digital marketing will become the major element in most companies' marketing activities.

9. Community sourcing to storm the stage

Web-enabled technology and social media give media companies tremendous opportunities to test new ideas rigorously, at speed and low cost. Many media companies now monitor feedback on their products in discussion forums or social networks, but only few go a step further and actually test or promote products within a community prior to launch.

MTV evidences how successful this can be. It heavily promoted its new drama series "Skins" months before launch across various social media, including Tumblr, Facebook, and its own community site in the US. The show already had a fan base in the US, since the original version was shown on BBC America. MTV's online initiatives quickly attracted momentum, with 5 million video streams and 700,000 unique views on the Skins.tv community site. @skinsTV on Twitter had over 8,000 followers as of the morning before its debut as well as 36,000 Facebook "likes" and 2,500 follows on Tumblr. MTV is monitoring the community closely and using feedback to improve the show. This is a highly interactive process involving the show's producers and dedicated resources.

An online check-in called Skins Captionbomb allows the audience to chat with other viewers and write their own commentary during the show. MTV even plans to reward users with MP3s and other bonuses using a points system. Innovative "community sourcing" techniques such as these can be adapted to every kind of product, and we predict much more intensive use of them in the future.

Key takeaway: Community sourcing will revolutionize strategic planning for telecommunications, media, and technology (TMT) companies as well as audience participation.

10. Mobile media becomes mass market

As mobile access penetration becomes saturated and prices decline, new technologies such as long-term evolution as well as new devices like smartphones and tablet computers offer further growth potential from digital content and service offerings. Mobile media usage and advertising spending have ramped up quickly and are set to become a mass market. Smartphone volumes were already at 56.7 percent of mobile phones in the US in Q1 2010, and the number of smartphones in use worldwide is expected to exceed 1.1 billion by 2013. Mobile devices are also evolving rapidly in terms of their capabilities and features. The success of Apple's iPad has defined a new market segment for tablet computers that will continue to see more players entering along with flourishing sales. Analysts from eMarketer have projected that global sales will rise from 15.7 million in tablet computers 2010 to 81.3 million in 2012.

Users are increasingly receptive to content and marketing. App stores are attracting large numbers of paying users: almost 80 percent of all iPhone users download paid apps. However, huge potential still remains untapped. 87 percent of the German population, for example, has never downloaded an app onto their mobile phone.

Among paid apps, games are the overwhelming driver of value in the iPhone App Store, accounting for 65 percent of the top 100 grossing apps, followed by sports and entertainment (each accounting for 8 percent), music (5 percent), and navigation (4 percent). Mobile games are also expected to remain the most attractive category,

especially if they blend social and location-based features. However, quickly declining price points and the dominance of free apps have affected monetization. Almost 50 percent of customers only download apps that are free.

The ability to consume, create, and share content via mobile devices translates into increasing involvement. Location-based services are becoming more sophisticated: retailers in particular will increasingly experiment with new opportunities. Mobile advertising is expected to see strong growth as a result. Major players in the field have already acquired mobile advertising networks, whether Google (AdMob) or Apple (Quattro), and are pushing the business forward.

Key takeaway: Surfing ahead of the mobile media wave is vital for success. Winners will enter into strategic partnerships, while keeping a keen eye on monetization potential.

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The impact of the trends outlined above will continue to grow. Companies in the TMT arena would be well advised to integrate these trends into their strategic outlook to identify new opportunities and unleash competitive advantages.

Outside voices

Articles in this section

Eric Schmidt on business culture, technology, and social issues

Google's executive chairman shares his strategies on hiring, running meetings, designing "mobile first" business models, and addressing joblessness and education reform.

Eric Schmidt and Dr. James Manyika

When Eric Schmidt handed the reins of CEO at Google back over to cofounder Larry Page recently to take on the role of the company's executive chairman, with a more external focus, news reports predictably recounted his oft-made joke that his role at Google had been to provide "adult supervision" for the company's cofounders, Page and Sergey Brin. Indeed, no one could argue that in Schmidt's ten years at the helm, Google had grown up into an extraordinary force in global business. Schmidt's track record atop the leader in Internet searches stands as remarkable story of steady growth, expanded reach and influence, and an innovative management style that will remain scrutinized as Schmidt, 56, takes on new duties.

Google now produces close to $30 billion in annual revenues, and its domain is growing well beyond search. The company's YouTube unit, with some 40 percent of the market for Web videos, is generating profits for the first time, and its Android operating system hums at the center of more smartphones than Apple's iPhone.

Yet the organization that Schmidt was instrumental in building still depends on hiring and retaining the brightest talent, as well as encouraging deep collaboration and granting substantial creative free space to its teams. In this talk at a McKinsey conference in Washington, DC, in mid-March, Schmidt spoke with McKinsey director James Manyika and described Google's approach to talent management, the mobile and data technology trends he sees shaping the coming years, and his views on public-policy issues such as joblessness and education.

Hiring and recruiting

One of the things about companies is, as you build them, you get a chance to sort of determine the culture, the people, the style. And one of the things that I learned—and I learned a lot from Larry and Sergey—is that it makes an enormous difference who you hire at every level. And people don't really sort of manage that. So we worked very, very hard on who's going to be in our company.

And we spent more time, and pretty ruthlessly, on academic qualifications, intelligence, intellectual flexibility, passion and commitment. What bothers me about management books is they all say this stuff generically, but nobody *does it*. You need to develop a culture where people actually are going to do what they're going to do, and you're trying to assist them.

They don't need me. They're going to do it anyway, because they're driven; they have that passion. They're going to do it for their whole lives. It's everything they ever wanted. And, oh yeah, maybe they could use a little help from me.

That's the kind of person that you want. At Google, we give the impression of not managing the company because we don't, really. It sort of has its own "Borg-like" quality, if you will—it just sort of moves forward. So you have the problem of, once you get started and get the right seating of people, you're going to get this kind of behavior. Then you have to deal with the odd people. Because not every one of these incredibly smart people is a team player, and so forth.

So I would suggest that as part of the recruiting, you need to look at whether they're sort of compatible with the other people. Benchmark [Capital] is a company in [Silicon] Valley which has been a very successful venture company, and they had a rule that they would hire people if when they walked down the hall and they looked in the room, people smiled at them. They wanted them around. And we don't have that rule.

Because we basically want people—even if you don't want them around, we still need them. But you have to sort of figure the interpersonal stuff out. If you have a meeting, and you have consensus without disagreement, you have nothing. So basically what I would do in a meeting is I would see if everyone agreed, and then I would try to get some controversy. And if you can get one person to say something, then the person who's shy, or a little concerned about saying it, will speak up. Then you have a real conversation. So you need a certain amount of discord in your meetings. If you just have discord, well, then you have a university, right?

So what you want to do is you need a deadline. So discord plus deadline. Who enforces the deadline? Me. That's my job. Or whoever's running the meeting. So if you have discord and deadline, then you're likely to produce a consensus. And if you look at the academic literature, and all of the surveys and so forth, this is going to produce, on average, the best sort of business judgment kind of outcomes. And I think that's roughly right.

We use 70–20–10: 70 percent on our core business, 20 percent on adjacent business, 10 percent on others, as a sort of allocation principle, and we are constantly moving people around to achieve that percentage. Another thing we have is something called 20 percent time, where we tell people, especially in engineering, that they can spend 20 percent of their time on whatever they want. Now, these people are not that clever. They work on things which are adjacent to their areas of interest, which is what we hired them for.

They're not off doing opera. Unless it's the browser, right? So the 20 percent time is a very good recruiting tool, but more importantly it serves as a pressure valve against managers who are obnoxious. So the way it works is, if you're my manager and you say, "Eric, you know, we're on deadline, we've got a problem," and so forth. I'll look at you, and I'll say, "I'm going to give you 100 percent of my 80 percent of my time."

It serves as a check-and-balance. And in practice that conversation doesn't occur, because it doesn't need to occur. There are many, many other examples. When you're

doing recruiting, make sure that you don't allow managers to hire their friends. Make sure you have a recruiting team, like universities do—a hiring committee.

We would allow people to have an arbitrary number of interviews. It got to the point where people were being interviewed 15, 16, 17 times, and then we were turning them down. So eventually, by fiat, I ordered that it be taken down to 8. And we've since statistically modeled that you can get a probabilistically correct outcome at 5 interviews. So if five people interview a person, you should be able to make a decision whether you're going to hire them.

'Mobile first' and the destruction of business models

The answer is basically mobile first, and cloud computing. I think everybody's sort of heard the speech. But the 15 seconds is that mainframe PC, and so forth, being replaced by cloud servers that have impossibly fast servers, connected by these networks to these mobile devices, of which the iPad and mobile devices are examples.

The term I've been trying to use there is called "mobile first." And I observed that the top technical people are building the most powerful applications on mobile devices first. This is a big shift, architecturally. It has a big implication. So I think that's in the next year or two. To talk about it beyond that we enter into much more of an area of speculation. So if you think about it over a five- or ten-year period, imagine that the infrastructure of the world, at least in the developed world, becomes fiber to the tower—so you have a gigabit. Fiber to your home, so you have a gigabit.

And by the way, South Korea, Singapore, Asian countries tend to be already putting the fiber in place, at least to the apartment [rises]. And then you have the wireless explosion. Wireless, you know, let's assume, for purposes of argument, a sustained 10 to 20 megabytes. So what does that mean that you could do with this platform?

One of the more fundamental things that's going to happen is that it completely crushes the business models of a large number of organizations. A typical example is that many of the media companies are organized around content and distribution. Well, the distribution part just goes away, because distribution becomes bundled and/or free, as part of that. Because a gigabit is so capable of handling it, the distinctions between television, radio, HD, all of that just go away.

There's no reason to have all those things. They're structurally not correct. Incumbents will fight this, but companies like Google and others will try to set up these networks that are pure digital infrastructure, to separate out content and transport. So that'll have a big, big impact on all of those guys.

I'm one of these people who believes that most industries transform, rather than disappear. And what happens is the media like to write [about] "the death" of something. But most industries morph, or they age, so they don't sort of go away. It's more a question of: can every business, can every industry be improved by real-time telemetry and analytics?

So why do I not know where the bus is, and how many minutes before the bus is going to come to my bus stop? Seems obvious. So why don't I know all of the detailed feedback about the car I'm buying, by crowd sourcing it? Seems obvious. When I check into a hotel, why doesn't it tell me what the guy before me paid, so I can negotiate to get that price?

When I go to a shopping center—a typical example is, I go to the equivalent of Wal-Mart, or one of those—it seems to me that I should be able to virtually visit the

store, and using the equivalent of [Google Maps'] Street View, going down the stock, I should see, [in] real time, what's on the [shelves]. Do I really have to drive to the store to know that they already have it in stock? Why can't I look at a picture, real time, and see it?

Over and over again, those are hugely transformative to the economics of the businesses. But they don't go away. The only thing that went away was pagers, and maybe watches, except as ornaments.

Another obvious one has to do with medicine. When I walk to the doctor, why does the doctor have to ask me the same questions over and over again? I'm not stupid. Why can I not just provide the equivalent of a USB dongle, which has my entire medical history? Or the equivalent, which is a cloud-based service. Wouldn't it be more efficient? Imagine if we discovered that every human's disease profile was actually slightly different, and that the gross categorization, "Oh, you're a cancer patient," or "Oh, you have a liver problem," or "Oh, you have a lung problem," is in fact wrong. The correct way to diagnose me is to view me as the patient, as opposed to me as a cohort of a much larger group.

It's probably true that disease is really per person, not per archetype. And that we'll discover in the next few years that uniquely built designer drugs, which are designed literally for you, will ultimately save a lot more lives. So that's another example.

Big data

In computer science, big data is one of the other great trends. I didn't highlight it so much because it's hard to sort of quantify. But the fact of the matter is that with modern telemetry, everything is recorded and measured these days. The amount of information that you can store and manipulate is phenomenal. We have, as I mentioned, developed data-mining algorithms, and so forth. They produce remarkable results. One of the more interesting ones has to do with statistical translation.

If you get enough pairs of things, you can basically translate from one to another. This is generically true, and so we can go 100 languages by 100 languages. And now we've recently introduced [a technology that allows you to] actually speak to a telephone and have it come out in another language on the other side.

This is, you know, out of science fiction. This is done, technically, by the way, by a relatively straightforward process—we hear the voice, digitize the voice, send it to the server, [then] the server puts it through the voice-to-text maneuver. The text is translated to the other language, and then it goes through a speech synthesizer. So it's relatively routine but magical in its outcome. There are example after example where people can do regressions, fast-Fourier transforms,[1] and other kinds of things on this kind of data, and discover new things.

One of the things that's interesting about biology is that much of biology in the future is likely to be statistical in nature, rather than analytical. We have so much information now about biological processes and so forth that with the appropriate algorithms, you can probably discover all sorts of interesting new things about life and genes and disease and so forth and so on, literally using the same techniques.

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1   An algorithm used to transform one function into another.

Addressing joblessness

The issue of joblessness is really a fundamental one, because a country that does not create new jobs, especially for its young people, is one that is essentially dying. I'm very, very concerned about the United States in this regard. Because everything seems fine; everybody I know is employed, the stock market's doing just fine, corporations have great earnings. As you know, we have $2 trillion dollars sitting offshore, which will repatriate if they figure out a way to solve the repatriation problem, et cetera, et cetera.

It does not address the problem of young people who cannot get jobs. Now, the problem with this in the Western world is it's really a structural problem involving education, the way trade unions work, the way training works, and so forth.

If you look at what Germany did, which is a better model than the Asian countries, they had a deliberate pro-export, pro-manufacturing industrial policy, where they actually shifted resources for people who were not going to be able to operate at the McKinsey [or] Google level, into various forms of highly skilled manufacturing jobs, and so forth. And it worked. Germany's total exports are larger than the US exports. It's an amazing statistic. And this is a high-wage, high-unionization country. So there [are] at least some examples of models that work. So if you're a young person today in America, you're going to work in healthcare—because that's where all the jobs are going to be created, because that's where all the spending is going to go. That's a public policy decision.

With respect to the joblessness, it's a series of things. You need max strategies. In these large governments there are so many different levers on things that people don't have any focus. So I suggested a number of max strategies. Let's go for a max energy strategy. Let's figure out a way to rebuild America's energy infrastructure by putting all those people to work, insulating buildings, which, as we know, and you've participated in a study that was quite coherent on this, that's in fact the best long-term economics.

By the way, it puts unemployed construction workers, who are the largest selection of unemployed people in America, to work. Let's do a max innovation strategy where we fund or come up with matching grants for the "Valley of Death" problem. There's a big problem in a bunch of industries, where the venture money is too small, and the debt financing is not available. They can't get from the idea to the plant. They literally can't build it. And I'm not suggesting the government fund it; I think you do some sort of shared risk, and there are a number of such models. There are green bank models, and so forth, and so on.

Reforming education

One of the most clarifying points to make about education in our country is that the education system is currently run for the benefit of the adults, and not the children. The incentives, the measurement system, the governance is all organized around the people who run it, as opposed to the outcomes. So the first thing you do is you try to measure what the outcomes are. And the measurements that have been done over and over again tell you that the only thing that matters is teaching. And that all of the other things people care about—class size, order, topics, and so forth—the quality of the teacher determines virtually all of the outcomes. So that's it.

Notice the way I framed it. You start with a data point, as opposed to all these other points. The most interesting experiment that I'm aware of, which Google is helping fund, is [being led by] a guy named Sal Khan at the Khan Academy. If you have a child, or if you know children, or if you've been a child, you must look at this. Because

what he figured out was that rather than having group conversation, if students are on individual programs which are measured down to the second, and the teacher becomes a consultant, you get statistically higher outcomes. And these trials are now being done.

What I would do is I would first figure out a way to change—the only way to change the labor union contracts in our country seems to be to have them go bankrupt. And public unions can't go bankrupt, as in other industries. So I hate to say it, but you have to do something terrible to get the contracts so that they're performance-based, as opposed to seniority-based. That's point number one. And performance can be measured.

And then the second thing is run enough longitudinal experiments with respect to these new forms of teaching, and then judge, based on the quality of the outcomes of the students, not the teachers, which ones you then standardize on.

The best story I know about this is that in California in the 1970s, they imposed the "new math" on all these unsuspecting people in California. And they never did any A, B trials. They never did any—they just decided. Well, we know now from analytics and research that we can actually test these things. So let's try a few things and see what works and do it based on the quality of the teacher. And that's how I would do it.

The second economy

Digitization is creating a second economy that's vast, automatic, and invisible—thereby bringing the biggest change since the Industrial Revolution.

Dr. W. Brian Arthur

In 1850, a decade before the Civil War, the United States' economy was small—it wasn't much bigger than Italy's. Forty years later, it was the largest economy in the world. What happened in-between was the railroads. They linked the east of the country to the west, and the interior to both. They gave access to the east's industrial goods; they made possible economies of scale; they stimulated steel and manufacturing—and the economy was never the same.

Deep changes like this are not unusual. Every so often—every 60 years or so—a body of technology comes along and over several decades, quietly, almost unnoticeably, transforms the economy: it brings new social classes to the fore and creates a different world for business. Can such a transformation—deep and slow and silent—be happening today?

We could look for one in the genetic technologies, or in nanotech, but their time hasn't fully come. But I want to argue that something deep is going on with information technology, something that goes well beyond the use of computers, social media, and commerce on the Internet. Business processes that once took place among human beings are now being executed electronically. They are taking place in an unseen domain that is strictly digital. On the surface, this shift doesn't seem particularly consequential—it's almost something we take for granted. But I believe it is causing a revolution no less important and dramatic than that of the railroads. It is quietly creating a second economy, a digital one.

Let me begin with two examples. Twenty years ago, if you went into an airport you would walk up to a counter and present paper tickets to a human being. That person would register you on a computer, notify the flight you'd arrived, and check your luggage in. All this was done by humans. Today, you walk into an airport and look for a machine. You put in a frequent-flier card or credit card, and it takes just three or four seconds to get back a boarding pass, receipt, and luggage tag. What interests me is what happens in those three or four seconds. The moment the card goes in, you are

starting a huge conversation conducted entirely among machines. Once your name is recognized, computers are checking your flight status with the airlines, your past travel history, your name with the TSA[1] (and possibly also with the National Security Agency). They are checking your seat choice, your frequent-flier status, and your access to lounges. This unseen, underground conversation is happening among multiple servers talking to other servers, talking to satellites that are talking to computers (possibly in London, where you're going), and checking with passport control, with foreign immigration, with ongoing connecting flights. And to make sure the aircraft's weight distribution is fine, the machines are also starting to adjust the passenger count and seating according to whether the fuselage is loaded more heavily at the front or back.

These large and fairly complicated conversations that you've triggered occur entirely among things remotely talking to other things: servers, switches, routers, and other Internet and telecommunications devices, updating and shuttling information back and forth. All of this occurs in the few seconds it takes to get your boarding pass back. And even after that happens, if you could see these conversations as flashing lights, they'd still be flashing all over the country for some time, perhaps talking to the flight controllers—starting to say that the flight's getting ready for departure and to prepare for that.

Now consider a second example, from supply chain management. Twenty years ago, if you were shipping freight through Rotterdam into the center of Europe, people with clipboards would be registering arrival, checking manifests, filling out paperwork, and telephoning forward destinations to let other people know. Now such shipments go through an RFID[2] portal where they are scanned, digitally captured, and automatically dispatched. The RFID portal is in conversation digitally with the originating shipper, other depots, other suppliers, and destinations along the route, all keeping track, keeping control, and reconfiguring routing if necessary to optimize things along the way. What used to be done by humans is now executed as a series of conversations among remotely located servers.

In both these examples, and all across economies in the developed world, processes in the physical economy are being entered into the digital economy, where they are "speaking to" other processes in the digital economy, in a constant conversation among multiple servers and multiple semi-intelligent nodes that are updating things, querying things, checking things off, readjusting things, and eventually connecting back with processes and humans in the physical economy.

So we can say that another economy—a second economy—of all of these digitized business processes conversing, executing, and triggering further actions is silently forming alongside the physical economy.

Aspen root systems

If I were to look for adjectives to describe this second economy, I'd say it is vast, silent, connected, unseen, and autonomous (meaning that human beings may design it but are not directly involved in running it). It is remotely executing and global, always on, and endlessly configurable. It is concurrent—a great computer expression—which means that everything happens in parallel. It is self-configuring, meaning it constantly reconfigures itself on the fly, and increasingly it is also self-organizing, self-architecting, and self-healing.

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1   Transportation Security Administration.
2   Radio-frequency identification.

These last descriptors sound biological—and they are. In fact, I'm beginning to think of this second economy, which is under the surface of the physical economy, as a huge interconnected root system, very much like the root system for aspen trees. For every acre of aspen trees above the ground, there's about ten miles of roots underneath, all interconnected with one another, "communicating" with each other.

The metaphor isn't perfect: this emerging second-economy root system is more complicated than any aspen system, since it's also making new connections and new configurations on the fly. But the aspen metaphor is useful for capturing the reality that the observable physical world of aspen trees hides an unseen underground root system just as large or even larger. How large is the unseen second economy? By a rough back-of-the-envelope calculation (see sidebar, "How fast is the second economy growing?"), in about two decades the digital economy will reach the same size as the physical economy. It's as if there will be another American economy anchored off San Francisco (or, more in keeping with my metaphor, slipped in underneath the original economy) and growing all the while.

Now this second, digital economy isn't producing anything tangible. It's not making my bed in a hotel, or bringing me orange juice in the morning. But it is running an awful lot of the economy. It's helping architects design buildings, it's tracking sales and inventory, getting goods from here to there, executing trades and banking operations, controlling manufacturing equipment, making design calculations, billing clients, navigating aircraft, helping diagnose patients, and guiding laparoscopic surgeries. Such operations grow slowly and take time to form. In any deep transformation, industries do not so much adopt the new body of technology as encounter it, and as they do so they create new ways to profit from its possibilities.

The deep transformation I am describing is happening not just in the United States but in all advanced economies, especially in Europe and Japan. And its revolutionary scale can only be grasped if we go beyond my aspen metaphor to another analogy.

A neural system for the economy

Recall that in the digital conversations I was describing, something that occurs in the physical economy is sensed by the second economy—which then gives back an appropriate response. A truck passes its load through an RFID sensor or you check in at the airport, a lot of recomputation takes place, and appropriate physical actions are triggered.

There's a parallel in this with how biologists think of intelligence. I'm not talking about human intelligence or anything that would qualify as conscious intelligence. Biologists tell us that an organism is intelligent if it senses something, changes its internal state, and reacts appropriately. If you put an E. coli bacterium into an uneven concentration of glucose, it does the appropriate thing by swimming toward where the glucose is more concentrated. Biologists would call this intelligent behavior. The bacterium senses something, "computes" something (although we may not know exactly how), and returns an appropriate response.

No brain need be involved. A primitive jellyfish doesn't have a central nervous system or brain. What it has is a kind of neural layer or nerve net that lets it sense and react appropriately. I'm arguing that all these aspen roots—this vast global digital network that is sensing, "computing," and reacting appropriately—is starting to constitute a neural layer for the economy. The second economy constitutes a neural layer for the physical economy. Just what sort of change is this qualitatively?

Think of it this way. With the coming of the Industrial Revolution—roughly from the 1760s, when Watt's steam engine appeared, through around 1850 and beyond—the economy developed a muscular system in the form of machine power. Now it is developing a neural system. This may sound grandiose, but actually I think the metaphor is valid. Around 1990, computers started seriously to talk to each other, and all these connections started to happen. The individual machines—servers—are like neurons, and the axons and synapses are the communication pathways and linkages that enable them to be in conversation with each other and to take appropriate action.

Is this the biggest change since the Industrial Revolution? Well, without sticking my neck out too much, I believe so. In fact, I think it may well be the biggest change ever in the economy. It is a deep qualitative change that is bringing intelligent, automatic response to the economy. There's no upper limit to this, no place where it has to end. Now, I'm not interested in science fiction, or predicting the singularity, or talking about cyborgs. None of that interests me. What I am saying is that it would be easy to underestimate the degree to which this is going to make a difference.

I think that for the rest of this century, barring wars and pestilence, a lot of the story will be the building out of this second economy, an unseen underground economy that basically is giving us intelligent reactions to what we do above the ground. For example, if I'm driving in Los Angeles in 15 years' time, likely it'll be a driverless car in a flow of traffic where my car's in a conversation with the cars around it that are in conversation with general traffic and with my car. The second economy is creating for us—slowly, quietly, and steadily—a different world.

A downside

Of course, as with most changes, there is a downside. I am concerned that there is an adverse impact on jobs. Productivity increasing, say, at 2.4 percent in a given year means either that the same number of people can produce 2.4 percent more output or that we can get the same output with 2.4 percent fewer people. Both of these are happening. We are getting more output for each person in the economy, but overall output, nationally, requires fewer people to produce it. Nowadays, fewer people are required behind the desk of an airline. Much of the work is still physical—someone still has to take your luggage and put it on the belt—but much has vanished into the digital world of sensing, digital communication, and intelligent response.

Physical jobs are disappearing into the second economy, and I believe this effect is dwarfing the much more publicized effect of jobs disappearing to places like India and China.

There are parallels with what has happened before. In the early 20th century, farm jobs became mechanized and there was less need for farm labor, and some decades later manufacturing jobs became mechanized and there was less need for factory labor. Now business processes—many in the service sector—are becoming "mechanized" and fewer people are needed, and this is exerting systematic downward pressure on jobs. We don't have paralegals in the numbers we used to. Or draftsmen, telephone operators, typists, or bookkeeping people. A lot of that work is now done digitally. We do have police and teachers and doctors; where there's a need for human judgment and human interaction, we still have that. But the primary cause of all of the downsizing we've had since the mid-1990s is that a lot of human jobs are disappearing into the second economy. Not to reappear.

Seeing things this way, it's not surprising we are still working our way out of the bad 2008–09 recession with a great deal of joblessness.

There's a larger lesson to be drawn from this. The second economy will certainly be the engine of growth and the provider of prosperity for the rest of this century and beyond, but it may not provide jobs, so there may be prosperity without full access for many. This suggests to me that the main challenge of the economy is shifting from *producing* prosperity to *distributing* prosperity. The second economy will produce wealth no matter what we do; distributing that wealth has become the main problem. For centuries, wealth has traditionally been apportioned in the West through jobs, and jobs have always been forthcoming. When farm jobs disappeared, we still had manufacturing jobs, and when these disappeared we migrated to service jobs. With this digital transformation, this last repository of jobs is shrinking—fewer of us in the future may have white-collar business process jobs—and we face a problem.

The system will adjust of course, though I can't yet say exactly how. Perhaps some new part of the economy will come forward and generate a whole new set of jobs. Perhaps we will have short workweeks and long vacations so there will be more jobs to go around. Perhaps we will have to subsidize job creation. Perhaps the very idea of a job and of being productive will change over the next two or three decades. The problem is by no means insoluble. The good news is that if we do solve it we may at last have the freedom to invest our energies in creative acts.

Economic possibilities for our grandchildren

In 1930, Keynes wrote a famous essay, "Economic possibilities for our grandchildren." Reading it now, in the era of those grandchildren, I am surprised just how accurate it is. Keynes predicts that "the standard of life in progressive countries one hundred years hence will be between four and eight times as high as it is to-day." He rightly warns of "technological unemployment," but dares to surmise that "the economic problem [of producing enough goods] may be solved." If we had asked him and his contemporaries how all this might come about, they might have imagined lots of factories with lots of machines, possibly even with robots, with the workers in these factories gradually being replaced by machines and by individual robots.

That is not quite how things have developed. We do have sophisticated machines, but in the place of personal automation (robots) we have a collective automation. Underneath the physical economy, with its physical people and physical tasks, lies a second economy that is automatic and neurally intelligent, with no upper limit to its buildout. The prosperity we enjoy and the difficulties with jobs would not have surprised Keynes, but the means of achieving that prosperity would have.

This second economy that is silently forming—vast, interconnected, and extraordinarily productive—is creating for us a new economic world. How we will fare in this world, how we will adapt to it, how we will profit from it and share its benefits, is very much up to us.

W. Brian Arthur is a visiting researcher with the Intelligent System Lab at the Palo Alto Research Center (PARC) and an external professor at the Santa Fe Institute. He is an economist and technology thinker and a pioneer in the science of complexity. His 1994 book, *Increasing Returns and Path Dependence in the Economy* (University of Michigan Press, December 1994), contains several of his seminal papers. More recently, Arthur was the author of *The Nature of Technology: What it is and How it Evolves* (Free Press, August 2009).

How fast is the second economy growing?

Here's a very rough estimate. Since 1995, when digitization really started to kick in, labor productivity (output per hours worked) in the United States has grown at some 2.5 to 3 percent annually, with ups and downs along the way. No one knows precisely how much of this growth is due to the uses of information technology (some economists think that standard measurements underestimate this); but pretty good studies assign some 65 to 100 percent of productivity growth to digitization. Assume, then, that in the long term the second economy will be responsible for roughly a 2.4 percent annual increase in the productivity of the overall economy. If we hold the labor force constant, this means output grows at this rate, too. An economy that grows at 2.4 percent doubles every 30 years; so if things continue, in 2025 the second economy will be as large as the 1995 physical economy. The precise figures here can be disputed, but that misses the point. What's important is that the second economy is not a small add-on to the physical economy. In two to three decades, it will surpass the physical economy in size.

Competing through data: Three experts offer their game plans

MIT professor Erik Brynjolfsson, Cloudera cofounder Jeff Hammerbacher, and Butler University men's basketball coach Brad Stevens reflect on the power of data.

Erik Brynjolfsson, Jeff Hammerbacher, and Brad Stevens

As big data creates new opportunities and threats, it also demands new mind-sets from senior executives about the role of information in business and even the nature of competitive advantage. The perspectives that follow may help shake up your thinking and forge that new frame of mind.

Massachusetts Institute of Technology (MIT) professor Erik Brynjolfsson explores the implications of intriguing new research about the relationship among data, analytics, productivity, and profitability. Jeff Hammerbacher, cofounder of the data-oriented start-up Cloudera, provides a view from the front lines about what it takes to harness the flood of data now at companies' collective fingertips. Finally, basketball coach Brad Stevens describes how, on a tight budget, he uses data that's powerful (even if not extraordinarily "big") to help his Butler University squad punch above its weight. Presented here are edited versions of interviews with each, conducted by McKinsey's Michael Chui and Frank Comes.

The professor: Eric Brynjolfsson

Erik Brynjolfsson is the Schussel Family Professor of Management Science at the Massachusetts Institute of Technology's Sloan School of Management, director of the MIT Center for Digital Business, and one of the world's leading researchers on how IT affects productivity.

The data advantage

Most great revolutions in science are preceded by revolutions in measurement. We have had a revolution in measurement, over the past few years, that has allowed businesses to understand in much more detail what their customers are doing, what their processes are doing, what their employees are doing. That tremendous improvement in measurement is creating new opportunities to manage things differently.

Our research has found a shift from using intuition toward using data and analytics in making decisions. This change has been accompanied by measurable improvement in productivity and other performance measures. Specifically, a one-standard-deviation increase toward data and analytics was correlated with about a 5 to 6 percent improvement in productivity and a slightly larger increase in profitability in those same firms. The implication for companies is that by changing the way they make decisions, they're likely to be able to outperform competitors.

Becoming data driven

The prerequisite, of course, is the technological infrastructure: the ability to measure things in more detail than you could before. The harder thing is to get the set of skills. That includes not just some analytical skills but also a set of attitudes and an understanding of the business. Then the third thing, which is the subtlest but perhaps the most important, is cultural change about how to use data. A lot of companies think they're using data, and you often see bar charts and pie charts and numbers in management presentations. But, historically, that kind of data was used more to confirm and support decisions that had already been made, rather than to learn new things and to discover the right answer. The cultural change is for managers to be willing to say, "You know, that's an interesting problem, an interesting question. Let's set up an experiment to discover the answer."

Too many managers are not opening their eyes to this opportunity and understanding what big data can do to change the way they compete. They have to be ready to show some vulnerability and say, "Look, we're open to the data" and not go in there saying, "Hey, I'm gonna manage from the gut. I have years of experience and I know the answers to this going in." I think, historically, a lot of managers have been implicitly or explicitly rewarded for that kind of confidence. You have to have a different kind of confidence to be willing to let the data speak.

One CEO told me that when he pushed this attitude, he had to change over 50 percent of his senior-management team because they just didn't get it. Obviously, that was a painful thing to have to do. But the results have been very successful. And they require that level of aggressiveness by top management, if it really wants to end up in that group of leaders as opposed to the laggards.

Required skills

Having enough data to get a statistically significant result is not a problem. There's plenty of data. So the skills often have more to do with sampling methodologies, designing experiments, and working these very, very large data sets without becoming overwhelmed. If you look inside companies, you also see a transformation in the functions that are using data. CIOs are discovering that, more and more, it's the marketing people and the people working with customers—customer relationship management—who have the biggest data needs. These are the people CIOs are working with most closely. This is part of a broader revolution as we move from just financial numerical data toward all sorts of nonfinancial metrics.

Often, the nonfinancial metrics give a quicker and more accurate measure of what's happening in the business. I was talking to Gary Loveman—the CEO of Caesar's Entertainment, formerly Harrah's, and a PhD graduate of MIT. He's used some of these techniques to revolutionize what's happening in that industry. But, interestingly, increasingly what he measures is customer satisfaction and a lot of other intermediate metrics. He said that customer satisfaction metrics were much quicker and more precise metrics of what was happening in response to some of the policy changes that he put in place.

Think of it this way. If customers end up satisfied or dissatisfied, that will affect the probability of their coming back next year. Now, next year's financial results will be affected as a result. And you could, in principle, try to match up the experience the customer had this year with future years' return rates. But a much quicker way of getting feedback on which processes are working is to look at customer satisfaction when you put process changes in place.

The new landscape

I think this revolution in measurement, starting with the switch from analog to digital data, is as profound as, say, the development of the microscope and what it did for biology and medicine. It's not just big data in the sense that we have lots of data. You can also think of it as "nano" data, in the sense that we have very, very fine-grained data—an ability to measure things much more precisely than in the past. You can learn about the preferences of an individual customer and personalize your offerings for that particular customer.

One of the biggest revolutions has involved enterprise information systems, like ERP, enterprise resource planning; CRM, customer relationship management; or SCM, supply chain management—those large enterprise systems that companies have spent hundreds of millions of dollars on. You can use the data from them not just to manage operations but to gain business intelligence and learn how they could be managed differently. A common pattern that we're seeing is that three to five years after installing one of these big enterprise systems, companies start saying, "Hey, we need some business intelligence tools to take advantage of all this data." It's up to managers now to seize that opportunity and take advantage of this very fine-grained data that just didn't exist previously.

The path ahead

There's some good news and there's some not-so-good news. The good news is that technology's not slowing down, and the pie is getting bigger. Productivity is accelerating. And that *should* make us all better off. However, it's not making us all better off. Over the past 20 years or so, median wages in the United States have stagnated because a lot of people don't have the skills to take full advantage of this technology. And, unfortunately, I don't see that changing any time soon unless we have a much bigger effort to change the kinds of skills that are available in the workforce and have a set of technologies that people can tap into more readily.

This flood of data and analytical opportunities creates more value for people who can be creative in seeing patterns and for people who can be entrepreneurial in creating new business opportunities that take advantage of these patterns. My hope is that the technology will create a platform that people can tap into to create new entrepreneurial ventures—some of them, perhaps, huge hits like Facebook or Zynga or Google. But also, perhaps equally important for the economy, hundreds of thousands or millions of small entrepreneurial ventures, eBay based or app based, would mean millions of ordinary people can be creative in using technology and their entrepreneurial energies to create value. That would be an economy where not only does the pie get bigger but each part of the pie—each of the individuals—benefits as well.

The data entrepreneur: Jeff Hammerbacher

Before cofounding Silicon Valley software start-up Cloudera in 2009, at the age of 26, Jeff Hammerbacher was a quantitative analyst on Wall Street and one of Facebook's first employees.

The open-source advantage

I was Facebook's first research scientist. The initial goal for that position was to understand how changes to the site were impacting user behavior. We had built our own infrastructure to allow us to do some terabyte analytics, but we were going to have to scale it to up to petabytes.[1] We realized that instead of continuing to invest in infrastructure, we could build a more powerful shared resource to facilitate business analysis by working with the open-source community.

In founding Cloudera, I saw a path to a complete infrastructure for doing analytical data management. It would be made up of existing open-source projects as well as open-source versions of a lot of the technologies that we had built out internally at Facebook. Cloudera would be a corporate entity for pursuing those goals and ensuring that it wasn't just Facebook that would be able to use this technology but, really, any enterprise.

Data leaders

When we started Cloudera, we didn't have a core thesis around where the technology would be adopted or what the market was going to look like. Early adopters were clearly in the Web and digital-media spaces. But in terms of traditional industries, the federal government surprised me. They really are the leaders in multimedia data analysis—working with text, images, video. In the intelligence agencies, I've seen more sophistication than in commercial domains.

I was also surprised to see the retail space. Retailers had very large volumes of data, and because many were branching out into e-commerce, they had a lot of Web logs and Web data as well. There is an arms race going on right now in retail. If you can understand consumer behavior and get your hands around as much behavioral data as possible to better guide product decision making, then every penny you can eke out is increasing your margins and allowing you to invest more.

Financial services was one sector that I had hoped would be an early adopter, but these companies tend not to look at their businesses as a whole in the same way that retail does. Data management is thought of as project specific, even to the point where individual trading desks could have their own chief technology officers. Our technology tends to work best as a shared infrastructure for multiple lines of business.

Where this is headed is learning how to point this new infrastructure for storing and analyzing data at real business problems, as well as growing the imagination of businesspeople about what they can do when a variety of experts analyze the data. If you can digitize reality, then you can move your world faster than before.

Building a big data function

You need to make a commitment to conceiving of data as a competitive advantage. The next step is to build out a low-cost, reliable infrastructure for data collection and

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[1]   Under the International System of Units, a terabyte equals one trillion bytes, or 1,000 gigabytes. A petabyte is equal to 1,000 terabytes.

storage for whichever line of business you perceive to be most critical to your company. If you don't have that digital asset, then you're not even going to be able to play the game. And then you can start layering on the complex analytics. Most companies go wrong when they start with the complex analytics.

When deciding how to incorporate analytics expertise into an organization, you have to be honest about what your organization looks like—your capacity to hire and your long-term vision for what that organization is going to be. There isn't one right answer. Yahoo! built a centralized group called Strategic Data Solutions to run the entire gamut. Rather than just building a small group of people primarily focused on marketing analytics, the company took an end-to-end view, extending from data storage to the actual P&L. In our group at Facebook, because we were a very fast-moving organization, we were much more of a platform—a service organization for the rest of the company.

The rise of the 'data scientist'

I tried to articulate this title of data scientist in a book I put together with O'Reilly Media.[2] I now actually see people describing themselves as data scientists in their job titles on LinkedIn and scientists talking about themselves as data scientists. So it's evolving. People realize that there is a gap between the current role of statistician or data analyst or business analyst and what they actually want. They are grappling with the set of tools and the set of skills that they need. Across the whole research cycle, it's a combination of skills that social scientists understand, plus additional programming skills, plus the ability to do aggressive prioritization. And, of course, a good grounding in statistics and machine learning.[3] That collection of skills is difficult to find.

The coach: Brad Stevens

Brad Stevens is head coach of the Butler University men's basketball team. Coach Stevens holds the National Collegiate Athletic Association (NCAA) record for most games won in the first four years as a Division I head basketball coach. Among those wins was a series of thrilling NCAA tournament games that brought his Butler University team to the championship final in 2010 and 2011.

Before joining Butler, which is located in Indianapolis, Indiana, and has just 4,500 students, he was a marketing associate at the global pharmaceutical group Eli Lilly. In the following interview, Stevens explains how focusing on the numbers has helped improve his team's game.

The Quarterly: *How have things changed in basketball with regard to the use of data and analytics?*

Brad Stevens: You know, I'm a bad person to ask about that because I'm 34. The data's always been an important part of my job. I've always looked at it through that lens, even when I was a young assistant. This is how I work best. For me, it's incredibly interesting. There are complexities that you can really study using numbers. We don't

2   Jeff Hammerbacher and Toby Segaran, eds., *Beautiful Data: The Stories Behind Elegant Data Solutions*, Sebastopol, CA: O'Reilly, 2009.

3   Machine learning is a form of artificial intelligence in which algorithms allow computers to make decisions based on data streams.

have access to the highest end—we're not sitting here with NBA[4] money to invest in a numbers-and-research department. But I think you can speak to your team with numbers and give your players pretty clear-cut and defined examples of what they need to do to get better.

The Quarterly: *If you had an infinite budget, what sorts of things would you do?*

Brad Stevens: The first thing is that I'd have one of the positions on our staff, or maybe a whole group on our staff, working on statistics. They would look at game planning and how players are most effective: what they're doing when they're most effective, where they are on the court—really show players the exact way that they are most effective in different areas of the game. That's an incredibly useful teaching tool.

The Quarterly: *In the absence of those resources, that staff, what do you do?*

Brad Stevens: I first break down all of the statistics that I can on opponents to try to get my mind wrapped around what their trends are. I'll look for how many three-point attempts per field goal attempt[5]—that tells you what kind of team they are right away. You can look at offensive-rebound percentages. Defensive- and offensive-turnover percentages. How teams shoot against them. What they defend well. What they try to defend well.

Then there's the ability to cut film on computers and to do so quickly. We can watch all of somebody's moves off of a ball screen. All of a person's moves going left. All of the post moves, going to the middle or going to the baseline. Whatever the case may be. And we can really determine their effectiveness from that. We obviously hope that the film validates the statistics and we can figure out what's unique about what players do.

One thing that you have to be careful of is not getting caught up in just season statistics. Teams change. And as we get to the latter part of the season, I'll spend a lot more time asking, "What's happened in the past five games? What are they doing differently from a statistical standpoint? What have they improved on? What have they regressed in?"

Of course, I can have all the data I want to have—but I still have to communicate it to our players. It has to get into their minds. And they have to utilize it. So you can't inundate them. You can't take three seconds to make a decision in basketball. It's a game that moves too quickly for that. There's no huddle in between plays; there's not a moment in between every pitch. You've got to have thoughts in your mind about what the people that you're playing against like to do, and what you do best, and at the same time you can't be inundated with those thoughts or it'll affect the way you play. That makes communicating data and simplifying it for the players incredibly important.

The Quarterly: *Can you say more about how you simplify data, how you engage your players?*

Brad Stevens: You've got to figure out how they react, how they best comprehend, how they best learn in a team setting, how they best learn in an individual setting, and go from there. Each team's different, each player's different. And, you know, it may mean bringing in a guy who has a mind for numbers and saying, "The bottom line is that, right now, you're shooting 43 percent. You're a better shooter than that. If you

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4   The US National Basketball Association.

5   For an explanation of basketball terminology, visit www.fiba.com/pages/eng/fc/baskBasi/glos.asp.

make one more shot a game, you're probably at 48 or 49 percent. How can we make it so you're one more shot effective for a game?"

The Quarterly: *Was there one game or a couple of games where this really played out and made a difference?*

Brad Stevens: Every game we play in. There's not a game when this wouldn't have played a major role. We're not the most talented, so we have to be good in these little areas. Sometimes, you know, the numbers hurt you. You believe one thing, and then the other team has a night that's unique. But more times than not, the score takes care of itself, as Bill Walsh[6] says.

Michael Chui is a senior fellow at the McKinsey Global Institute and is based in McKinsey's San Francisco office; **Frank Comes** is a member of McKinsey Publishing and is based in the New Jersey office.

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6   Bill Walsh coached the US National Football League's San Francisco 49ers to three Super Bowl titles (1982, 1985, and 1989). His book *The Score Takes Care of Itself: My Philosophy of Leadership* (Portfolio, August 2009), published two years after his death, was coauthored with his son, Craig, and with Steve Jamison.

Inside P&G's digital revolution

CEO Robert McDonald wants to make the consumer goods giant the world's most technologically enabled company. Here's how.

Robert McDonald, Dr. Michael Chui, and Tom Fleming

Robert McDonald is a CEO on a mission: to make Procter & Gamble the most technologically enabled business in the world. To get there, the 31-year company veteran and former US Army captain is overseeing the large-scale application of digital technology and advanced analytics across every aspect of P&G's operations and activities—from the way the consumer goods giant creates molecules in its R&D labs to how it maintains relationships with retailers, manufactures products, builds brands, and interacts with customers. The prize: better innovation, higher productivity, lower costs, and the promise of faster growth.

McKinsey's Michael Chui and Thomas Fleming recently sat down with McDonald at P&G's Cincinnati headquarters to talk about the nature and progress of the company's digitization initiative, as well as its implications for P&G's people and culture. An edited summary of the interview follows.

In the accompanying sidebar "'My leadership philosophy'," McDonald reflects on how his experiences as a US Army Airborne Ranger inform his approach to leading P&G.

Real-time insights

Our purpose at P&G is to touch and improve lives; everything we do is in that context. With digital technology, it's now possible to have a one-on-one relationship with every consumer in the world. The more intimate the relationship, the more indispensable it becomes. We want to be the company that creates those indispensable relationships with our brands, and digital technology enables this.

One way is through consumer feedback. In 1984, when I was the Tide brand manager, I would get a cassette tape of consumer comments from the 1-800 line and listen to them in the car on the way home. Then, back at the office, I'd read and react to the letters we'd received. Today that's obviously not sufficient—you've got blogs, tweets, all kinds of things.

And so we've developed something called "consumer pulse," which uses Bayesian analysis to scan the universe of comments, categorize them by individual brand, and then put them on the screen of the relevant individual. I personally see the comments about the P&G brand. This allows for real-time reaction to what's going on in the marketplace, because we know that if something happens in a blog and you don't react immediately—or, worse, you don't know about it—it could spin out of control by the time you get involved. The technology also lets us improve things that *are* working. For example, we're rolling out a product called Downy Unstopables, a fragrance addition you can add to your wash, and the real-time comments from consumers about the product's characteristics are helping us figure out how best to join in the discussion through our marketing efforts.

From factory to shelf

From an operational standpoint, we also believe that to be successful we've got to continue to improve productivity, and being digitally enabled allows for that as well. So we're digitizing our operations everywhere—from our manufacturing plants to the stores where consumers purchase our products. We believe digitization represents a source of competitive advantage.

In our manufacturing plants, for example, we have systems that allow people to use iPads to download data off the production line in real time and communicate that to a place where we roll the data up. We're not there yet, but we envision a system where I could literally see, on my laptop, any product at any moment as it goes through the manufacturing line of any one of our plants. And what I'd love to be able to do is see the costs of that product at the same time. It's challenging because accounting systems aren't designed today for operations—they tend to look backward—but we're working on integrating our operational system with the financial system to move in that direction.

In transport and logistics, we created a digitally enhanced operational program we call Control Tower that lets us see all the transportation we're doing: inbound, outbound, raw materials, finished product. We're probably the second- or third-largest user of trucks in the United States, and through this technology we've been able to reduce "deadhead" movement[1] by about 15 percent. This reduces costs and carbon monoxide. In circumstances where we use distributors, a similar interface, called Distributor Connect, lets us link directly with them and help them run their business. This benefits all of us by improving service and reducing inventory across the supply chain.

We want to be digitally connected to retailers too. For example, we use and support GDSN,[2] which is basically a standardized data warehouse that allows us to do commerce with our retail partners in a totally automated way, with no human intervention. The industry association GS1 did a study a few years ago that found that 70 percent of orders between retailers and suppliers had errors. But if everyone used a common data warehouse like GDSN—where the data are kept dynamically correct— that number goes down to virtually zero, and it saves millions of dollars in doing commerce together.

Another thing we do is to use our scale to bring state-of-the-art technology to retailers that otherwise can't afford it. Imagine a small store in the Philippines, for example—a country where I used to live. We can provide sophisticated ordering applications to help people there run their businesses better than they would be able to otherwise. We

1   When trucks are empty or not optimally loaded.
2   Global Data Synchronisation Network.

have mobile-phone applications that allow retailers to order from us wirelessly or, if they don't have a wireless capability, to order when they go back to their office and set the phone in a base. It's very easy to use.

We also have performance standards that retailers in developing markets can visualize on their phones. For example, we believe you should arrange your store in a certain way to maximize consumer sales. If you have a store that partners with P&G on this, you can call up the performance standards on your phone, hold it up, look around your store, and compare it with what you see. Eventually, I want to be able to take a picture of the shelf, have it digitally compared, and then automatically send action steps back to the retailer to help rearrange the shelf for maximum consumer sales. That's where we're going.

In fact, some applications like these will probably come back to the developed world as improvements because they'll be simpler—there's no question that progress will be accelerated by the leapfrogging of technology. Inevitably, everything's got to be usable on the smallest, cheapest device possible because that's what's going to get the broadest distribution in a developing market.

Digitizing innovation

Data modeling, simulation, and other digital tools are reshaping how we innovate. The way we used to do innovation research required a lot of work and time setting up consumer panels—you need the right distribution of races, ages, and so forth to make them representative. Now, with the amount of data we have available, the "n" is so large that by definition we can immediately have a representative group.

When you design a disposable diaper the traditional way, for example, by the time you get to the point where you make a prototype, the prototype itself has cost thousands of dollars, if not more, and it was all made by hand. Now, using modeling and simulation, you can go through thousands of iterations in seconds. The key is that you've got to have the data. So the advantage for P&G is our scale. We have operations in around 80 countries, our products are sold in almost every country, and we touch more than four billion consumers every day. Imagine all those data points. We can literally fit any virtual diaper to any baby anywhere in the world.

We're even digitizing the creation of molecules. For example, in the research and development for our new dishwashing liquid, we used modeling to predict how moisture would excite various fragrance molecules so that throughout the dishwashing process you get the right fragrance notes at the right time. We did that all virtually.

I think that digital technology will even help us identify new service components to our consumer products that wouldn't otherwise be immediately obvious. For example, say you're a consumer concerned about the environment. You go to one of our packages and photograph the QR[3] code. We then could download for you all the ingredients in the product and their biodegradability—or tell you where the product was produced, the quality of the water, or how we've reduced carbon emissions in the plant. We can't do that today, but it's an aspiration.

Improve data at the source

P&G employees have a "cockpit" interface on their computers that they help design. It has certain tolerances for the metrics that are important to them. When we go

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3   Quick Response.

outside those tolerances, either negatively or positively, an alarm goes off. Then we can click down and understand what's going on and react to it, because we feel that time compression—or operating in real time—is a competitive advantage.

Similarly, every Monday morning we have a meeting with our leadership team all over the world—physically and virtually—where we review the business for the previous week and click down on all this data. And everyone signs up for the principles behind this—it's real time and continuous; it gives us the ability to click down to find causality, make decisions, and then move on.

As we apply those principles each week, the challenge becomes the data source. I'll use the Philippines again as an example. If a company we buy syndicated data from goes into stores in the Philippines once every two months and does a handheld questionnaire audit, then it doesn't matter if we meet every Monday or not. Our data's not going to be very good. So we've been working with all our data partners to help them understand that our need is for real-time data. For us it's really constraint theory—understanding where the constraint in our data is and pushing it all the way to the data source. Then, change the data source.

For companies like ours that rely on external data partners, getting the data becomes part of the currency for the relationship. When we do joint business planning with retailers, for example, we have a scorecard, and the algorithm is all about value creation. Getting data becomes a big part of the value for us, and it's a big part of how we work together. We have analytic capabilities that many retailers don't have, so often we can use the data to help them decide how to merchandise or market their business in a positive way.

It would be heretical in this company to say that data are more valuable than a brand, but it's the data sources that help create the brand and keep it dynamic. So those data sources are incredibly important. Therefore, we go to the extreme to protect whatever consumer data we get. It's a board-level enterprise risk-management issue for us. We have very clear firewalls between one retailer and another and strict policies—for example, about how long a "cooling off" period you need to have when working on projects with different retailers. All of this comes with our strategy of being the most digitally enabled company in the world. We can't do that without being an industry leader on data security and privacy.

The digital workforce

When I started with P&G, in 1980, almost nothing was digital. Back then, our Management Systems Division—as we called it then—had mainframe computers, but our people did more work on phone systems than on computers. And whenever I would get together with them, I would ask, "How many of you have coded BCD?"[4] or, "Have you ever done a Monte Carlo simulation?" Nobody would raise a hand. They didn't have those kinds of skills.

More than two decades later, as vice chairman of global operations, I and my colleague Filippo Passerini, who today is the CIO of P&G,[5] began to put together some very clear strategies to hire people with different skills. We needed people with backgrounds in computer modeling and simulation. We wanted to find people who had true mastery

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4   Binary-coded decimal, a digital-encoding method for decimal numbers. Each digit is represented by its own binary sequence.

5   See "From internal service provider to strategic partner: An interview with the head of Global Business Services at P&G," mckinseyquarterly.com, July 2008.

in computer science, from the basics of coding to advanced programing. When you've actually done a simulation, you truly realize the importance of the data; it's classic "garbage in, garbage out."

We've come a long way toward meeting our goals today, but we still have further to go. For example, we established a baseline digital-skills inventory that's tailored to every level of advancement in the organization. We have a training facility to make sure that if you're in a particular area, you're competent on the systems for that area. This goes for senior managers too; we have an area in the facility where we can pull the curtains, so to speak, and work with senior managers privately so we don't embarrass anyone. But we've got to have the standards for everyone because otherwise we'll dumb the organization down to the lowest common denominator.

Ultimately, though, P&G has been pretty good about hiring for analytical thinking. We hire very good people and then train them. I remember the day I joined the company and one of the managers a few levels up said, "Throw away your MBA textbooks and we'll teach you; we'll give you another MBA." And I think that's still practical and relevant today. Nonetheless, analytical-thinking skills have become even more important to this company. We need to come up with the ideas to innovate, and those innovations are always informed by data.

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'My leadership philosophy'

Robert McDonald explains how lessons he learned in the Army have helped shape his business career.

The Quarterly: *You're a graduate of the US Military Academy at West Point, and before coming to P&G you were a captain in the US Army Airborne Rangers, an elite infantry unit. How have those military experiences helped you in your business career?*

Robert McDonald: West Point is all about leadership—first learning to be a good follower and then learning how to lead. And when you graduate, you are responsible for the lives of soldiers, so you get a lot of experience at a very young age. During Arctic warfare training, for example, you're trying to get soldiers from Point A to Point B, and it's 60 degrees below zero. If they sit down, they'll die. Experiencing that teaches you a lot about yourself and probably results in some additional self-confidence, an ability to deal with stress, and also experience in motivating and leading people.

The Quarterly: *Has your military background ever been a disadvantage in business?*

Robert McDonald: I've always said that George C. Scott's portrayal in the movie Patton was the worst thing that could happen for military leadership. We're not trained to stand up in front of the American flag and spew profanities or to slap soldiers who are in the hospital. So as I was coming through my career, now and then I had to overcome situations where people might apply a caricature or stereotype to me before they got to know me.

But that's really changed, and I think business is realizing that there's a lot to learn from the military. The military, for example, came up with the concept of VUCA—volatile, uncertain, complex, and ambiguous—and the whole idea of leadership agility in a VUCA world is something companies can learn from.

The Quarterly: *In what ways do you apply what you learned in the military to leadership development at P&G?*

Robert McDonald: One way is through sharing a set of personal beliefs—a list of principles based on my experiences in the military and business—that I use in leadership-training courses at P&G, as well as on college campuses. [See "Leading with values," below.]

The Quarterly: *When did you create your list and why?*

Robert McDonald: I probably started it 20 years ago or more, though I periodically review and refine it. I found that I was always telling stories, and those stories became an important aspect of leadership for me. And rather than repeating them all the time, I thought that it would be really worthwhile to write these down. Those stories eventually became my statement of beliefs.

I was also influenced by meeting a fellow West Point graduate, Ed Ruggero, who was working on a book about the importance of having a personal leadership philosophy.[6] It turned out the US Navy had started doing something similar to what I'd been doing—they ask new leaders to write down their beliefs and share them with their personnel.

The Quarterly: *What benefits have you seen as a result of the exercise?*

Robert McDonald: Over the years, I have found tremendous value in it. By writing down what you believe and sharing the results with the people you work with, everyone learns what's important to you—and that's what subordinates always crave. As a leader, it forces you to be much more deliberate about leadership. Also, if I do something contrary to my beliefs, people can call me on it, and I have to explain what I'm doing. This creates trust and empowers the people who work for me.

That sense of empowerment is very important—and one reason I strongly encourage all managers at P&G to conduct the exercise themselves and share the results with their people. I want a culture where every person in the organization is prepared to make a difference, and sharing what you believe, and why, helps create that kind of culture.

This idea very much intersects with our strategy of digitization. As P&G gets bigger and bigger, the tendency is to become more hierarchical, more bureaucratic, more apt to only focus on the things that made us successful in the past. We don't want that, and digital technology enables us to flatten the organization and help avoid those problems. At the same time, we want a democracy of ideas where people raise their hands and take "ownership." We may all be looking at the same data, but it's no one's job to tell anyone else what to think. I want people to challenge things and draw their own conclusions. It's the value of ownership.

Leading with values

Senior executives can benefit from codifying their beliefs and sharing them with colleagues, says P&G CEO Robert McDonald. In his document titled "What I believe in," which he shares with managers at P&G and elsewhere, McDonald explains the ten principles that make up the values-based leadership model he says influences him most:

1. Living a life driven by purpose is more meaningful and rewarding than meandering through life without direction.

2. Companies must do well to do good and must do good to do well.

3. Everyone wants to succeed, and success is contagious.

6   Ed Ruggero and Dennis F. Haley, *The Leader's Compass: A Personal Leadership Philosophy Is Your Key to Success*, second edition, King of Prussia, PA: Academy Leadership Publishing, 2003.

4. Putting people in the right jobs is one of the most important jobs of the leader.

5. Character is the most important trait of a leader.

6. Diverse groups of people are more innovative than homogenous groups.

7. Ineffective systems and cultures are bigger barriers to achievement than the talents of people.

8. There will be some people in the organization who will not make it on the journey.

9. Organizations must renew themselves.

10. The true test of leaders is the performance of the organization when they are absent or after they depart.