9. Access to Information



One of the most important impacts of information technology (IT) is making individuals' access to information more convenient and efficient. The Internet is where the IT revolution is most evident as it now contains all kinds of information touching every part of modern life. New technologies are making all that information easier to find and verify while also expanding the opportunities to interact with, contribute to, and view all sorts of information. The IT revolution is not limited to the Internet, though, because other technologies such as kiosks and portable storage are making information accessible from anywhere. These advances are

creating a world where libraries have no walls and keep no hours, where information can be found easily assuming it does not find the seeker first, and where the way people physically interact with information is expanding in exciting new ways.

Growth of Information Online

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

With a few strokes on a computer keyboard, Internet users can learn about a foreign destination they wish to travel to, find reviews about local restaurants, or discover the best neighborhood bicycle routes. Indeed, it is hard to imagine living without the Internet, yet not too long ago if one wanted to learn about Mozart, driving to the local library was often the only option. Now with search engines like Google and online encyclopedias like Wikipedia, volumes on virtually any subject are but a click away.

In education, students are no longer limited by the walls of a library or the expertise of a single teacher because they can access resources from a global classroom and connect with both fellow learners and subject matter experts regardless of geographic proximity. In health care, patients can study their conditions using the same materials as their doctors, share insights with people suffering from similar maladies, and get not just a second opinion but the best opinion on how to proceed with various treatments. In government, citizens no longer have to wait in lines, fill out forms, and dig through paper records to find the information they need to be productive members of society because they can get the materials they need online.

The impact of IT on improving individuals' lives through improving their access to information has been profound, making daily activities more efficient and robust. In personal finance, for example, balancing a checkbook is arguably a thing of the past as anyone can instantly check their balance using a computer, ATM machine, or cell phone. Most every bank in developed countries now has a website that allows customers to learn about and apply for loans, make transfers, and set up automated payments. Studies have shown that the more services someone uses from an online banking provider, the more pleased they become at its ease of use in comparison to traditional banking.[1]

For individuals looking to manage their money, investment strategies used to be limited by the lack of access to robust, real-time information. Now many individuals choose to forgo stockbrokers to manage their own investments because there is very little information available to professionals that cannot be found by amateurs through online research. In addition, the process of buying a stock or bond is just a few clicks away. In Japan, online trading has exploded, with the number of accounts at Japanese electronic brokerage firms growing from fewer than 300,000 to nearly 8 million since 1999, and Internet trading now accounts for more than a quarter of all equity trades in the country.[2]

Similarly, in personal consumption, shopping has been transformed through the availability of online information. Just about anything that can be bought in a store can be bought online, even perishables like groceries—and consumers have embraced these possibilities around the world, with more than 85 percent of the world's online population having purchased something using the Internet.[3] Also instead of relying on the Sunday paper to learn when sales

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are on, one can quickly and easily compare prices between multiple stores online. Currently, for example, two-thirds of U.S. consumers use the Internet to research purchases before going to the store.[4] Most significant of all, consumers are no longer limited to the opinions of friends and the endorsements of celebrities to influence their decisions when making purchases because reviews written by real people are available for almost any product or service to help consumers make more informed decisions about how to most effectively spend their money. Companies can even use IT to put information online about each specific product the company ships. Thus, for example, computer manufacturers like Dell allow customers to look up product information based on the unique serial numbers printed on each device. Another company, EggFusion, puts a code on every egg it sells that allows consumers to log onto the company's website and find information about the freshness of each individual egg.[5]

Improved access to information also allows individuals to learn about things without having to be physically present. Virtual tours of houses, for example, save prospective homebuyers hours on the road going from property to property by letting them first see inside a building before deciding if it is worth a trip to view the property in person. In addition, homeowners now have access to the same information as real estate agents, which is helping enable some sellers to forgo using an agent altogether, thereby allowing them to save the money it costs to pay a commission; homebuyers can now obtain a lot of information about a property on their own without having to rely solely on the insights of a real estate agent.

Many aspects of life continue to be improved by the ever-increasing availability and quantity of information accessible online. This trend will only continue as more information comes online and new tools are developed to making it easier to find and access the information.

The Power of People to Expand Information Availability and Access

One of the most striking aspects of the IT revolution is how it enables new sources of information to be created by lowering the barriers of publishing to allow anyone to contribute to the Internet's collective knowledge base.

Blogs have become platforms for individuals to have their voices heard. Though most blogs do not deal with matters of substance, many are being written by subject matter experts, be they professional or amateur, sharing their insight into trends, commenting on news, and providing free analysis and new perspectives that previously might never have found the light of day. Blogs provide an opportunity to find the unfiltered opinions of people around the world, from consumers to innovators, and they are now often being used by industry as well to announce new products, services, and hires in a less structured and often more informative way than a press release.

Tapping the collective wisdom of the crowd to compile more comprehensive sources of information is the defining characteristic of a wiki, websites that allow users to contribute by adding or modifying content. The most prominent example is Wikipedia.org, an online encyclopedia created and updated by its users. But wikis are also increasingly being used inside corporations, schools, and government agencies in order to create a public or private knowledge base to help the organization run more efficiently. Other online content management systems, such as Microsoft SharePoint similarly facilitate information sharing and provide a dynamic resource for online collaboration.

In addition to creating new information resources, the power of people is being tapped to help make information easier to find. At a most basic level are initiatives like that at the U.S. Library of Congress, which now offers the ability to e-mail or chat with a librarian over the Internet. So now, instead of having to hunt and peck through the shelves to find the right book, scholars can just send a request to a librarian and the librarian will help find it for them.

Taking this a step further, a number of sites have sprung up that allow anyone to pose questions to subject matter experts and receive specific answers. One such site is AllExperts.com, which features a host of volunteer experts ready to answer questions on topics ranging from how to create great animation to computational biology to tips for dealing with chronic pain. Simply select an expert, pose a question, and receive an answer. Combining the

ability to ask questions of experts with the power of the collective consciousness are sites like Yahoo! Answers, where questions can be posed to an open, global audience of potential experts. Anyone can answer and anyone reading the question can weigh in on which answer is their favorite, helping determine which answers to trust as they rise to the top.

User input helps direct people to new information and engage in better decisionmaking. User reviews help online shoppers decide which product to buy and which merchant to trust. Home chefs can search through online recipes and choose dishes with the best ratings and find the most useful tips. Internet radio broadcasters like Pandora even help listeners discover new content by using algorithms to recommend specific music based on user feedback. Similarly, a key feature of Netflix's online movie rental system is its user rating system, which allows the company to recommend movies for users on the basis of their feedback and rental history.

Where human power really revolutionizes the capabilities of search to deliver high quality, highly relevant information is through a site like Mahalo.com. Users enter keywords into Mahalo like a regular search engine, but the difference is that for the most popular search terms, Mahalo enlists freelancers and full-time guides to create the best search results pages they can. Unlike most search engines, which count the number of times a keyword appears and how many sites link to a page, Mahalo uses human reviewers to organize sources into verified lists of results for the most popular keywords, enabling people to find the best possible resources for their topic of interest.

Finding Information Expeditiously

The improvements being made in the ability to find information are not limited to people power, though, as a number of exciting advances are being made in expanding old-fashioned search while also revolutionizing the ability to find information without having to look for it.

Finding Needles in the Haystack

When someone wants to find something but does not know where to look, the place to start for most is a search engine. Input a keyword or three and instantly the user is presented with a series of links to sites from across the Web. Search engines come in many shapes and sizes in order to cater to the needs of different audiences. Highlighting the global adoption of search and the Internet as a source of information for a global audience is the fact that four of the top ten most popular search engines in the world are based outside of the United States: Alibaba and Baidu (China), NHN (South Korea), Yandex (Russia).[6]

The same keyword search paradigm—and often even the same technology—is now in use on most every website as well, giving users the ability to search an entire site by entering a keyword in order to quickly find the specific information they need rather than having to hunt through all the individual pages. In addition, apart from indexing text, search engines increasingly index images, audio, and video. The challenge with searching multimedia content using keywords is that the search engine must rely on metadata or tags to determine the content. Even when multimedia lacks identifying tags, though, developers have found innovative ways to search multimedia content. The website blinkx.com, for example, uses a combination of speech recognition and video analysis software to identify the contents of an audio or video file and create metadata "on the fly" without human involvement. Going a step further, companies such as EveryZing have developed products that leverage speech recognition technology to index the complete contents of audio and video files, allowing users not just to search these files but also to jump right to the particular point in a media file that contains the pertinent information.

One difficulty with all these search engines is that they require users to specify the right words to find the right answers. Introduced to overcome this and add an element of serendipity are relational searches. Although relational searches encompass a wide range of things, at their core, relational searches suggest topics related to an initial search, often displaying these relationships in graphical form. An example is VisualThesaurus.com. Type in a word and results are shown as a spider web around the primary term. Click on an orbiting word and it becomes the center with a whole new set of analogous words around it. Using this technique, users do not have to know the

specific word to find what they are looking for.

The future of search can be found at the nexus of relational and natural language search in a concept called the Semantic Web. What this boils down to is computers beginning to understand the meaning of things, associating the word "dog" with canine, companion, and animal, and recognizing when the meaning of words change because of context. Some of the first applications claiming to introduce the Semantic Web are just coming online now—like Powerset, a semantic search engine that searches Wikipedia.org entries on the basis of the meaning of a topic, phrase, or question the user enters not just by matching up the specific words the user enters. Eventually, computers will better understand what users are searching for and therefore be able to more efficiently route them to the content that is most relevant to their needs. In the meantime, there are thousands of search engines from hundreds of countries.[7]

Search is even proving helpful in non-Internet, bricks-and-mortar scenarios. For example, some book and electronics stores have installed kiosks that allow shoppers to more easily find what they are looking for in what are often massive stores while also providing a way to check on the availability of a product at other outlets of the same chain if that particular store happens to be out of stock.

Finding Local Information

The information that is most relevant to people is that which deals with where they live, for such information has the most direct impact on individuals' day-to-day lives. Until recently, for example, most people relied on newsletters and the yellow pages for information such as the time of the next neighborhood association meeting or the location of a store that sells a particular product. Finding geographically relevant information, though still difficult, is getting easier. In the developed world, most local media outlets—whether print, radio, or television—have an online presence stocked with stories related to specific geographic markets. They also typically have tools that help citizens stay in touch with the comings and goings of their community. In addition, specialty aggregators such as Yahoo's Upcoming.org pull together event listings from multiple sites so people can always know when or if something fun is happening in their community.

The IT revolution has enabled new sources of information to be created by lowering the barriers of publishing to allow anyone to contribute to the Internet's collective knowledge base.

Global positioning system (GPS)-enabled phones allow users to find georelevant information based on their precise location at any given moment. Applications like Lightpole allow for robust local search where users can enter keywords like restaurants and instantly know what is close by, not just restaurants but also more specific information like happy hours and Wi-Fi hotspots. Sites like Google Maps build on this to allow for awareness of things like traffic conditions on the roads between user and destination, even going so far as to offer StreetView in some cities, which provides an on-the-ground perspective of what a particular destination looks like.

Even for individuals not near a computer, Google offers 1-800-GOOG-411 in the United States and Canada. Users that dial that number reach an automated 411 information service. State the city and either name or type of business and the system's speech recognition retrieves the appropriate results and even offers to connect the caller. Not only is GOOG-411 quicker and easier than traditional 411 where there is often a wait to talk to a human operator, it is also free.

Information That Finds the User

The common thread between all the modes of content discovery just discussed is that they require the user to actively try to find information. But IT also enables a host of ways for information to find users without them having to look for it first. Travelers can have airlines automatically contact them when their flight is delayed. Banks can notify customers when they are about to overdraw an account. Customers can sign up to be alerted about new sales at their

favorite stores before they are widely advertised. In these ways, IT helps enhance quality of life by getting information to people before they even know to look for it.

Another tool that helps users automatically receive content is RSS, short for Really Simple Syndication. Using RSS, users can subscribe to a website and receive updates when new information is posted on that website. Subscribing to an RSS feed is like subscribing to get a magazine delivered to the home rather than having to go to the store to buy it. RSS readers also allow users to create custom searches that will alert the user when it finds new content that matches their interests. In this way, users can have relevant information find them rather than them having to go out and find it. Businesses use this same model to create a digital memo system that automatically notifies relevant parties when information such as company policy changes.

RSS is not limited to webpages because it can also be used to enable multimedia feeds. The most common of multimedia feeds are podcasts, which are typically recorded Internet radio shows. Users can download podcasts on thousands of topics—from learning to speak a foreign language to university lectures to congressional hearings. Users can even set up a program like iTunes not only to download podcasts automatically but also to synchronize them with a portable media player, meaning the content is ready for them to listen to within moments of becoming available. Although podcasting got off to a slow start, from June 2007 to March 2008 the percentage of global Internet users who download podcasts more than doubled, from just over 20 percent to 45 percent.[8]

Accessing Information from Anywhere

Another important impact of IT is allowing users to access the information they need whenever they need it. For example, a person on the road needing access to a file sitting on a desktop computer back home can use software to remotely access the desktop computer. Professionals on the go like salespeople can also tap into computers and databases back at the office through virtual private networks, giving them the ability to retrieve critical documents whenever they are needed. A popular consumer extension of this concept are services that allow for remote access to multimedia content, like Orb Networks, which provides users instant access to the photos, music, videos, and other digital content on their personal computer at home from any Internet-connected computer or device.

There is a growing realization that in order to thrive in the digital age, access to the Internet and an understanding of how to use it are essential.

Despite the many benefits of accessing information over the Internet, there is still something to be said for physical digital media that do not require connectivity to work and which continue to grow larger in capacity while getting smaller in size. USB flash drives, for example, make for a convenient and speedy way to transfer information, and their large capacity means a lot of data can fit into a pocket. USB flash drives are only one example of the rise of ubiquitous portable storage. There are pens now that can record and store voice messages and some can even register what is being written. Personal media players such as iPods contain storage that can just as well be used for documents and data as for music and movies. For example, Nike+ is a system that combines sensors in shoes with a receiver that plugs into an iPod nano to keep track of data like the amount of time and distance ran and calories burned. As a result, runners on the go have not only their music in their pocket but also a host of other information.

Another instance of IT enabling access to information whenever it is needed is in circumstances where language is a barrier. Nothing can be more frustrating to a traveler or businessperson than having the right person to talk to but not the right words. But now a host of technologies are making on-the-go translation possible. Handheld electronic

dictionaries, for example, can not only show words and definitions but can also speak them; and they can even use speech recognition to translate spoken words or phrases from one language to another. In addition, services like Kwingo.net deliver industry-specific phrases and terms to cell phones for areas like construction and food service.

In the early days of the Internet, lots of information was online, but many people lacked Internet access, so they could not take advantage of the information. Today access to digital information is growing as more households become connected to the Internet. Currently, the majority of households in many parts of the developed world have access to broadband Internet service.[9] In addition, wireless networks of all shapes and sizes are expanding the reach of broadband in both developed and developing countries. Satellite and WiMAX networks promise to rapidly increase the number of people who can access the Internet, and Wi-Fi networks have become so ubiquitous that in many urban and suburban areas around the world free Wi-Fi access can be found in restaurants, coffee shops, and hotels.[10] In addition, Internet cafes allow anyone to rent time on an Internet-enabled computer. In China alone there are reported to be more than 100,000 Internet cafes.[11] The availability of Internet access in such cafes is especially important for rural areas in China, where there are an average of only 2.7 computers for every 100 people. More than half of rural Chinese users access the Internet in these cafes.[12]

In addition, cell phones have achieved mainstream success, though the high-speed cellular networks that serve them have been more of a mixed bag. Although nearly 500 million cell phone users worldwide subscribe to a next generation 3G network, Asian- Pacific countries that have aggressively deployed the technology account for nearly half of that number.[13] The advantages of 3G are higher data speeds that allow for more robust mobile applications, especially those involving video. These high-speed wireless networks are especially useful for individuals with a job where they are on the go all of the time and may not have a regular office at which to gain access to information. Whereas it used to be professions like taxi driver or long-distance trucker meant only being able to know what is going on through the radio and citizens' band radio, today those same people can access everything available on a computer wherever on the road they might be.

Internet access is also being provided for free at public institutions like libraries. Through the efforts of programs like the Bill & Melinda Gates Foundation's U.S. Libraries Initiative, nearly every public library in the United States now offers free access to computers and the Internet.[14] Although similar initiatives are being pursued around the world, they often run into challenges associated with insufficient connectivity. In Africa, for example, many universities have as much connectivity as an average U.S. household but they share that connection among all of the students, many of whom have given up trying to use the universities' computers because of their slow speed and have been forced to pay high rates for Internet access at Internet cafes.[15] There is a growing realization that in order to thrive in the digital age, access to the Internet and an understanding of how to use it are essential.

Dedicated kiosks also provide access to digital information. These often single-purpose terminals are enabling access to information including travel information, banking information, event schedules, weather, and job applications. Such kiosks provide a dedicated alternative to having to go out and find information on the Internet, putting digital information right at a user's fingertips.

There is no end to the impact of IT on expanding, enhancing, and revolutionizing our access to and relationship with information. IT is not only making a limitless amount of new information available; it is also making it easier to find the information that is most relevant to our needs while also redefining how we physically relate to that information.

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To learn more or to download a copy of the complete report, please visit the Information Technology and Innovation Foundation online at www.innovationpolicy.org.

About the Information Technology and Innovation Foundation

ITIF is a non-profit, non-partisan public policy think tank committed to articulating and advancing a pro-productivity, pro-innovation and pro-technology public policy agenda internationally, in Washington DC and in the states. Recognizing the vital role of technology in ensuring American prosperity, ITIF focuses on innovation, productivity, and digital economy issues.

Technological innovation, particularly in information technology, is at the heart of America's growing economic prosperity. Crafting effective policies that boost innovation and encourage the widespread "digitization" of the economy is critical to ensuring robust economic growth and a higher standard of living. However, as in any new and changing situation, policymakers have varied awareness of what is needed and what will work. In some cases legislators have responded to new and complex technology policy issues with solutions more suited for the old economy. And as the innovation economy has become increasingly important, opposition to it from special interests has grown. Finally, the excitement that the press, pundits and decision makers showed toward the information technology (IT) revolution in the 1990s has all too often been replaced with an attitude of "IT doesn't matter." It is time to set the record straight—IT is still the key driver of productivity and innovation.

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