

8. Recreation and Entertainment



Technology—from radio and record players to television and digital video disc (DVD) players—has a long history of opening up new ways to entertain ourselves. But the information technology (IT) revolution is enabling endless possibilities to improve, expand, and enhance our recreational and entertainment experiences. Indeed, as discussed below, IT is redefining consumers' relationships with traditional media and pointing the way to a more entertaining future by improving the quality of entertainment, offering more choices in entertainment, allowing more control of the media experience, and enabling consumers to participate in creating media.

Improving the Quality of Entertainment

Technology has long been bringing about improvements in the quality of entertainment, whether via the development of clearer sounding FM radio, more vivid color TVs, or better sounding LP records. But digital technology has taken the quality of entertainment to a whole new level because it can produce images and sounds that analog technology could never match.

Digital technology works by breaking up pictures or sounds into discrete bits (1s and 0s) and reassembling them for playback. Dramatic advances in processing power, storage, displays, and transmission mean that the number of bits keeps growing, thus improving quality. It is easy to remember watching movies on videocassette recorders (VCRs) and seeing the distortion on the screen as the videotape lost its integrity or listening to the hiss of vinyl records that had been played one time too many.

Digital technology provides the same high-quality sound or image time after time with no degradation in quality—one reason that DVD technology, which introduced high-quality digital video to the mass market, gained such rapid and widespread adoption. DVDs look so much better than video home system (VHS) tapes, and the quality of DVDs does not degrade over time with multiple playbacks. Similarly, music compact discs (CDs) sound perfect every time they are played.

Now high-definition (HD) video and audio has made possible sounds and pictures that are sharper and clearer than ever. As prices of high-definition

satellite, and telephone companies in the increasingly competitive video marketplace have made the availability of HD video a key battleground in their bid for new subscribers. For that reason, they have all invested heavily in upgrading their networks' digital capacity in order to handle more HD channels and greater amounts of on-demand HD content. Today many networks deliver dozens of HD channels and hundreds of hours of on-demand HD content. Tomorrow that growth should only continue as more HD content gets produced, TV providers expand their capacity for offering HD, and more consumers buy new HDTV sets.²

The expansion of faster broadband networks is also making it easier to download HD video from the Internet—one reason why HD video is beginning to appear more regularly on the Internet. In the United States, all four major TV networks now offer free full-length episodes of first-run TV shows online and on-demand, delivering full-screen video that, if not HD quality, is at least DVD quality—a big rung up the evolutionary ladder from the coast-sized window of a typical YouTube video.

True HD video is also beginning to be available for download on the Internet through legal online movie purveyors like CinemaNow or BitTorrent. Streaming HD with instant-on-demand playback is also beginning to appear, as evidenced by TheHDWeb.com—a high-profile initiative powered by leading content delivery network Akamai that demonstrated HD video streaming is possible. The proof-of-concept initiative was sponsored by Verizon FiOS (Fiber Optic Service). Consumers need a relatively high-speed Internet connection, a minimum

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TVs (HDTVs) have decreased, sales of HDTVs have been growing.¹ And the format of the new Blu-ray (made with a blue laser) disc—which is the same size as a DVD but allows far greater storage—enables consumers to watch movies in HD on video discs.

But the future of high-quality video delivery is not limited to physical media such as DVDs. Cable,

of a steady 7.5 Mbps connection, to watch a single HD video stream.

As amazing as HD video is, though, it is only the beginning. Quad HD, a video standard with four times the resolution of HD, is already being developed for use in movie theaters as a way to attract moviegoers back to the theater by delivering an ex-

perience that can not yet be replicated in a home theater. In addition, Japan has recently ratified the Ultra HD standard, which has 16 times the resolution of HD, as their national goal for what they want to be broadcasting in by 2012.

And out on the horizon is the tantalizing possibility of three-dimensional TV without those funny glasses—think hologram, like Princess Leia in *Star Wars* when R2D2 shows her saying, “Help me Obi-Won Kenobi”—a technology that is currently working in the labs but is still a few years off from being commercially available for consumers. The future of interactive video displays also comes straight out of the movies. Technologies like IO2Technology’s Heliodyisplay project images into mid-air, viewable from multiple angles, using standard inputs like DVD video, and requiring no special hardware or software to view the images. The more advanced interactive video systems can even register hand movements and translate them into actions. Such technology is truly science fiction brought to life, fundamentally expanding our relationship with information. Soon, fully realized three-dimensional TV will be possible in the home.

The quality of the touchscreens found in many digital devices is also improving. Microsoft Surface, for example, is a 30-inch tablelike display that not only registers touch and gestures in order to navigate menus but also senses what devices are placed on it. On an even bigger scale, touchscreens the size of walls have been demonstrated at tradeshow promising a future where ads are interactive, allowing people to touch them to learn more. TV channels like CNN have replaced green screens with touchscreens as a way for hosts to interact with and display information during shows.

The trend to higher quality is evident in digital cameras, too. The quality of pictures from the original digital cameras was good but usually not as good as the pictures from high-quality cameras that relied on chemical film processing. Over time, however, the resolution (pixel quality) afforded by digital cameras has grown significantly. The cameras built into cell phones today feature the same 1- to 3-megapixel resolution found in consumer cameras a few years ago. In addition, many sub-\$200 digital cameras today can take pictures with 6- to 8-megapixel resolution, roughly equating to film. Digital movie cameras are

Box 8-1: The Networked Living Room

The networked living room is an important technological revolution for entertainment that is just now cresting over the horizon. As recently as a couple years ago, living rooms were hardly ever networked. People watched TV on their TV, listened to music on the stereo, and accessed the Internet on their computer.

Today all of these devices are coming together. Thus, for example, digital video recorders (DVRs) can download video from the Internet and show it on a TV. Likewise, gaming consoles like the Xbox 360 let consumers purchase or rent TV shows and movies and download them right into their living room. Indeed, high-speed broadband, the widespread availability of content, and a networked living room have led some to eschew traditional TV service altogether to rely solely on Internet video.

What could take all this even further is the upcoming potential of TVs that can connect directly to the Internet without the need for a separate box. The first versions of these networked TVs are already on the market, though they tend to only allow access to “walled gardens” of content. In addition, networked Blu-ray players will enable users to play trailers for upcoming movies, download additional foreign language tracks not included in the original release, and even participate in interactive gaming. Internet-enabled consumer electronics, such as music players that can play Internet radio stations, will allow Internet applications to break free from the desktop and become more integrated into our lives. As more Internet-enabled technologies such as music players become available, people will be able to rely on networked experiences for entertainment even if they do not have a computer.

improving in quality, as well. The first digital movie cameras were competing with the decidedly inferior technology of VHS rather than film. Now consumer-priced digital movie cameras have HD capabilities, offering a quality of picture that rivals film and leaves VHS far behind in the dust.

Although the impact of digital technology on the quality of video may be more readily apparent, digital audio is also improving in quality. A string of new audio formats like Super Audio CD and DVD-Audio have entered the market with the goal of dethroning audio CDs by offering additional features like high-

er quality content. Currently, however, CDs remain the most popular medium for audio. The main competition to CDs has come from the Internet—for example, via the digital downloads available through online stores like iTunes. Although iTunes uses the Advanced Audio Coding (AAC) format, most audio files distributed online use the MP3 format, which compresses files to make them smaller. The quality of audio downloads in MP3 format is no better than a CD and often worse, though still good enough to satisfy most consumers.

Audio formats like MP3, AAC, and Ogg Vorbis can encode files at higher bitrates and thus produce better quality audio than a CD, but they do take up more storage space. The reason higher quality audio has not become mainstream is that the mass market has deemed CD-quality good enough. For that reason too, the latest digital broadcast technologies like satellite and HD radio tend to aspire only to CD quality. Still HD radio is a significant improvement over existing terrestrial radio, offering a far higher dynamic range and frequency response that leads to better sounding high and low notes.

The area of entertainment that has shown the biggest improvement in quality is probably high-tech gaming. Today's high-definition, fast-moving, and lifelike video games bear little resemblance to games like Pong that were such hits in the 1970s and 1980s. Indeed, the digital revolution has enabled the video game industry in the United States to grow into a nearly \$10 billion-a-year business.³ In some countries, including South Korea, online gaming has become such a phenomenon that there are entire TV channels devoted to covering the top players and tournaments. One reason for the popularity of gaming is that higher quality sound and video enable gaming experiences that come much closer to simulating real life. In the past couple of years, with the release of the Microsoft Xbox 360 and Sony PlayStation 3 video game consoles, gaming has taken a huge step forward in this direction. Both of these consoles are massively powerful machines, so powerful that some researchers have been known to string together Sony PlayStation 3s to crunch numbers in lieu of renting time on supercomputers.⁴

The development of video games always lags behind the computing power and capacity of new hardware platforms, but the games that are on the

market today have reached the point where the quality of every element of their graphics look as good if not better than the prerendered cut scenes of games 10 years ago. Whereas there used to be a stark difference between gameplay and cut scenes, today the two look seamless, with some high-end games achieving photorealistic HD images. New hardware has also led to the introduction of new types of remote controllers for video game consoles. The remote controller for the Nintendo Wii, for example, has received much attention for its innovation combination of an accelerometer and a light sensor so that the device can register motions such as pointing and swinging.

The same trends leading to higher quality graphics in video console games also apply to games played on personal computers. The combination of faster processors, more memory dedicated specifically to graphics rendering, and bigger hard drives has brought forth a new age of high-quality gaming where realistic simulations of everything from driving a racecar to piloting a plane to commanding a World War II platoon is possible. Moreover, the ability for games to be more lifelike and have greater functionality is enabling the creation of a host of games that contribute to education and training.

Offering More Entertainment Choices

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

This expansion of choices in entertainment can be seen in the growing number of channels available on subscription video and audio services. On the TV side of things, choice has definitely increased with the introduction of digital TV technologies like digital cable, satellite TV, and Internet Protocol TV (IPTV). The move from analog to digital broadcasts now under way will allow hundreds of additional

channels to be delivered over existing networks. In addition, because of competition in the TV marketplace, TV providers continue to invest in increasing the size of the on-demand libraries they can offer their customers.⁵ As a result, children, for example,

can watch a vast number of short video clips on their website. Movies can be also purchased online for viewing. Although there are still some limitations in terms of what movies are available on what terms (e.g., rental versus retail), there is no limit to the number of titles and types of

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can choose from vast selections of kid-friendly and educational content.

In radio, satellite radio is providing consumers at home, in their cars, and elsewhere vastly more music choices than the limited number of stations available in any one local over-the-air radio market. The fierce competition between XM and Sirius—the merger of which was tentatively approved by the Federal Communications Commission in July 2008⁶—drove both companies to commit big dollars towards locking up exclusive deals with a host of high-profile media properties. As a result, anyone can tune in to any Major League Baseball or National Football League game on satellite radio rather than turning on the radio to listen to the home team and can also listen to a diverse array of original shows being produced by established stars like Oprah Winfrey and Bob Dylan.

The place where the expansion in entertainment choices is really playing out is the Internet. Indeed, the variety of video, audio, books, photos, and other entertainment now available online is breathtaking. Beyond opening up entertainment content in people's home countries, the Internet is making domestic entertainment content available internationally. Thus, for example, people can listen to Internet radio stations from around the world to hear news and information from abroad or to enjoy cultural or entertainment programming from distant countries. In addition, with bandwidth increasing to support IPTV to the home, some companies are offering a wide range of foreign language video broadcasting.

TV networks and many cable networks now offer full-length first-run episodes on the Internet to watch on-demand for free. Some networks even make entire seasons of shows available, and most TV networks, large and small, have at least some num-

ber of short video clips on their website.

Movies can be also purchased online for viewing. Although there are still some limitations in terms of what movies are available on what terms (e.g., rental versus retail), there is no limit to the number of titles and types of business models that can be implemented online. To see the online entertainment choices available now to consumers, it is worth looking at what is happening in sports broadcasting. In the past, sports fans wanting to watch a game of their favorite team had to hope it was broadcast on their local TV—an unlikely event if their favorite team was not the team in their local media market. Now the Internet is giving people vastly increased choices in the sports events they can watch. In the United States, all the major sports networks, at a minimum, deliver clips of game highlights online; and most sports networks offer free and paid packages for people who want to watch entire events live and on-demand, with coverage that far outstrips that which is available on TV. During the National Collegiate Athletic Association basketball playoffs, for example, CBS streams live video of all the games online, while the local TV affiliate shows only one game at a time. The expansion of options in sports broadcasting is not limited to domestic sports either. The Internet is opening up the world's arenas to anyone interested in sports that do not get enough mainstream coverage in their home countries. Take soccer or cricket, two sports with huge international followings. Fans of soccer or cricket who do not get coverage in their home country can pay a monthly fee and start watching the games and matches over the Internet so they do not have to miss out.

The IT revolution is not just providing more entertainment choices from the standard fare of TV networks and studios; it is also opening up a wide array of entertainment choices that previously could only be viewed or heard live by the people who were there. Indeed, the biggest Internet video success story to date has been the video-sharing site YouTube, which hosts user-submitted content. YouTube and

Box 8-2: Entertainment in Your Pocket

The amount and variety of entertainment that can fit into a pocket seems to know no bounds as continuing technological innovation has increased the capacity and opportunity of handheld devices. The 800-pound gorilla of mobile media for the 21st century has been Apple's iPod, with more than 170 million units sold. The iPod redefined the ease with which massive libraries of music could be enjoyed through its signature click-wheel interface.⁷ It also introduced a new model for music distribution through the close integration between the iPod device and iTunes service.

Over time, Apple has continued to develop the iPod platform into revolutionary new form factors. One innovation has been the push into smaller and smaller profiles, eventually resulting in an MP3 player called the iPod shuffle that is only 1.5 inch by 1.5 inch and weighs a mere half ounce. Another other major iPod innovation has been the big viewing window and touchscreen of the iPhone and iPod Touch. Both of these introduced a new high for the ratio of screen-to-device size, offering an unmatched viewing experience for a mobile device. Their multitouch interfaces rely on gestures rather than pushing button to makes tasks like mobile Web browsing more robust and intuitive than ever.

The market for portable media players continues to gain new entrants as company after company tries to dethrone the iPod. Though no company has captured the public's attention the way Apple has, a number of companies have developed products that have established

profitable niches by focusing on offering greater capacity, bigger screens, and additional features like built-in radio tuners.

Consumers are also gaining more choice in leveraging the multimedia capabilities of their mobile phones. Although Apple's iPhone introduced in 2007 revolutionized the mobile Web browsing experience, every major wireless carrier is making aggressive moves into offering music, video, and gaming services to their customers through their phones. Today people can watch individual video clips, tune into live TV, listen to music paid for by individual song or as a subscription service, and download and install a whole host of games, all on their mobile phones. Purchasing and listening to music on a mobile phone has proven so popular in Japan that it accounts for 91 percent of all digital music sales in that country.⁸

There are still many barriers to using mobile media. Mobile phones themselves, for example, are limited in terms of storage capacity, screen size, and, often, network connectivity. In addition, it is uncertain where mobile entertainment services fit into consumers' overall entertainment choices. Mobile phones cannot yet replace things like TV so consumers can not substitute one medium for another. But with a number of companies investing heavily in building out services along with the never-ending evolution in the capabilities of these mobile devices, there is little doubt that mobile media will be a key part of the future of entertainment.

websites like it allow anyone to upload a video and share it with the world. By drawing upon the "power of the crowd," these sites host deep and diverse libraries that feature everything from funny home movies to news and TV clips to video diaries to professionally produced original shows.

Such sharing is what allows for the viral growth some videos achieve. A few people see a particular video and like it; they share it either privately with some friends or publicly on a different website; and then more people continue to see and share the video with others in their social network. For those who think the video choices on the Internet are a "vast wasteland," it is important to note that within all the content are some real gems. One of

the most popular Google videos, for example, is the "Amazing Juggling Finale," featuring performer Chris Bliss. *The Washington Post* described the video as follows:

It is just a guy, three balls, and an ornate stage at some unnamed live event. The Beatles' melancholy "Golden Slumbers" begins playing on a loudspeaker, and the gray-haired man in the dark shirt and pants is suddenly juggling in perfect sync to the music. For 4 1/2 minutes, he tosses and grabs, his hands and body language capturing the pace and mood of the Fab Four as they build to the rousing three-song finale of the "Abbey Road" album. When the music ends and the last ball is caught, the crowd is on its

*feet, roaring. The man takes a bow and walks off the stage.*⁹

What the digital revolution did was allow this juggling performance to be seen and enjoyed by millions who otherwise would never have had a chance to see it. The video clip was actually from a 2002 comedy festival and remained a largely unnoticed posting on Bliss's personal website until early 2006, when someone came across it and sent to a group of friends. The video quickly became an Internet sensation and, thanks to the wonders of viral marketing, was viewed more than 20 million times by mid-April 2006.

Not only have the video choices on the Internet exploded; the audio choices on the Internet have also exploded. It used to be that radio listeners were limited to the stations their antenna could pick up. Now through Internet radio, listeners can tune in to online versions of over-the-air radio stations from around the world that also stream over the Web, as well as from thousands of online-only radio stations created by anyone with enough passion for music. Likewise, it used to be that music CDs listeners bought were limited by what CDs were available in the local store unless they wanted to wait for a package to arrive in the mail. Now through digital downloads, listeners can access online stores that provide instant access to millions of tracks. Increasingly, listeners can get music directly from their favorite artist, even if they have yet to make a recording deal with a major studio. More and more music is being created exclusively for distribution over the Internet.¹⁰

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

Allowing More Control of the Media Experience

Beyond providing a much wider array of higher quality entertainment, IT is empowering consumers to exert more control over their media experience. The idea of giving consumers control over their media experience began in large part with the VCR, which allowed for "timeshifting" of TV programming—that is, recording TV shows at one time and watching them at another time when it is convenient.

Timesharing has been taken to a new level with the introduction of the digital video recorder (DVR), which has made recording shows, storing them, and later playing them back as easy as pushing a button. More than one out of every five households in the United States already uses a DVR to timeshift TV programming, and the number is growing rapidly.¹¹

One of the greatest things about IT is that it offers portability, allowing media users to experience their media—whether it be it video, audio, or photos—in a variety of place. IT enables not just timeshifting of TV and other programming but also "placeshifting" of such programming. A device from Sling Media known as a Slingbox, for example, sits between a person's cable box and TV set and enables the person's at-home TV service to be made available through any broadband-enabled computer. The placeshifting concept includes all instances where someone takes a digital file to watch or listen to it somewhere other than where it was downloaded—for example, watching a TV show on a portable media player such as an iPod.

The ability to control one's media also includes the rise of the networked household. Networked DVRs allow multiple TVs to be equipped with small boxes that give any TV in the house access to the content stored on a central DVR—another example of placeshifting allowed by IT. A wide variety of IT-enabled products—including the functionality of the Media Extender for Xbox 360, AppleTV, and a new product from Sling Media called SlingCatcher—also make it possible to send media from a computer to a TV. Sitting in middle of all these trends is the in-home media server, like HP's MediaSmart Server, which serves as the repository for all of a user's media and makes those media accessible to the user both at home and remotely.

Box 8-3: Entertainment in the Car

Like everything in the 21st century, cars are increasingly going digital, loading up with entertainment opportunities, and getting online, all thanks to IT. As recently as a decade ago, installing video entertainment technology in cars was largely unheard of outside of high-end conversion vans with built-in TVs. But as liquid crystal display (LCD) screens have grown smaller and less expensive, and consumers have grown more demanding, the paradigm of in-car video entertainment has shifted dramatically.

Today many family vehicles like minivans come equipped with LCD screens and digital video disc (DVD) players as standard features. Some are even being sold with gaming consoles already built in, or at least with entertainment centers ready to accept their input. Beyond that, it is now possible to install mobile satellite television receivers in cars. In addition, auto manufacturers are working with consumer electronics companies like Apple to equip their vehicles with iPod docking stations on the dashboard.

But these are all turn-of-the-century technologies. In the years ahead, there seems to be no end to the ways in IT and entertainment will become mobile. Two big revolutions on the way are in-car storage and connectivity. Already, some higher end car models are being offered with built-in media servers, which are basically hard drives that allow for storage of audio and video without needing to carry discs. Developers are also working to enhance in-car connectivity using wireless broadband technologies like 3G (the third generation of developments in wireless technology). In addition to offering Web surfing from the backseat of cars and traffic updates to in-car navigation systems, in-car connectivity also offers a more elegant solution for loading audio and video onto an in-car media server.

Enabling Consumers to Participate in Creating Media

In the old economy, producing video and audio entertainment was something that only professionals and large companies did. A large part of the reason was that recording and editing video and audio required costly, powerful, dedicated software and hardware that was hard to use. Moreover, distribut-

ing a video or audio required millions of dollars and access to distribution networks linked to movie theaters and retail stores.

In today's digital economy, IT has reduced many of the barriers to production and distribution of video and audio entertainment by consumers. Digital technology has made it cheaper and quicker to produce media than ever before. Inexpensive cameras and audio recorders abound, and powerful software allows regular people to do editing on regular computers. In fact, IT makes it possible for limited editing to be done right inside an Internet browser.

Combining IT-enabled media production technologies with an open platform for sharing media like YouTube has resulted in a remarkable revolution in the attitudes of consumers: Instead of just leaning back to watch videos and other media, they are now also leaning forward to participate in production. With today's technology, people can make a video diary with a webcam, produce an amateur short film, or upload their photos and home movies to share with friends and family. As a result, millions of homemade videos, songs, and text are now available online. A measure of the success of the phenomenon is that 80.4 million viewers in the United States watched 3.42 billion videos on YouTube in February 2008 alone.¹² Users of YouTube's website watch hundreds of millions of videos and upload hundreds of thousands of videos every day; and 10 hours of new content is uploaded to the website every minute.¹³

And users are not just producing videos. Many electronic games allow users to create and share new challenges or levels to complete in the game. Also on the rise are gaming platforms like Fyrebud.com that provide basic gaming engines, images, and sound effects to let users create their own customized games.

All of these examples leverage the power of the crowd in the creation of video and audio entertainment. Rather than relying solely on professionals to produce content, companies now rely on the vast segment of the public that enjoys participating in the creative process. By leveraging their own talents, consumers are gaining access to a much wider variety of content while at the same time feeling empowered to engage in the process of creating media of their own.

There can be no understating the impact IT has had, is having, and will continue to have on entertainment. IT has given us access to more entertainment content in more places in more packages than ever before—and the diversity and quality of entertainment options continues to grow. Some of the technologies covered in this chapter will undoubtedly fade away, new ones will most certainly

rise to take their place, and others still will find their way into the hearts and minds of the public. What can be said with utmost certainty, though, is that the use of IT to enable entertainment will continue to grow and evolve and reshape our understanding of how we relate to the experience of consuming audio, video, games well on into the future.

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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.

As a result, the mission of the Information Technology and Innovation Foundation is to help policymakers at the federal and state levels to better understand the nature of the new innovation economy and the types of public policies needed to drive innovation, productivity and broad-based prosperity for all Americans.

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