Paul Sagan & Tom Leighton

The Internet & the future of news

By any measure, the growth of the Internet over the last decade has been astounding. It took the telephone seventy-five years to reach fifty million users; it took television thirteen years. It took the Web just five.[1] In a few short decades, the Internet has gone from an obscure technological novelty to something as basic and essential to our lives as electricity. It now connects nearly a quarter of the total world population, having succeeded in reaching the farthest stretches of the globe where simpler necessities, such as clean running water, have not. By 2013, there will be 2.2 billion Internet users worldwide, and the technological trends we are seeing today – rapid-fire growth in broadband, wireless, and video on the Internet – foreshadow an accelerated pace of innovation and breadth of impact that will be felt for generations to come.[2]

Over the past decade, we have begun to see how the Internet is transforming nearly every industry and aspect of society – from news to entertainment, politics to business, and communications to commerce. The impact of the Internet on journalism is simply a microcosm of the larger phenomenon of dramatic change brought about by the online digital revolution.

The Internet's ubiquity and easy accessibility offer an immediacy of information that no other news medium can match. This has irrevocably accelerated the pace of the news, as journalists race to stay ahead of each other as well as their audiences' demands. Similarly, the way people consume the news has changed. People are no longer restricted to their morning papers and the evening news broadcasts. They listen to podcasts on their way to work; check for news updates on their cell phones; watch, pause, and rewind live video newsfeeds on the Internet; and read and comment on blogs at the office, the gym, or the corner coffee shop.

Even more significantly, the Internet has endangered the concept of one-way news, be it in print or broadcast. News is now personalized and interactive; the audience is taking charge. Viewers choose from more sources of news than ever before. They share news stories with their social networks, helping to dictate a story's distribution. They shape the discourse and coverage of the news. And more and more, they are helping to capture, write, and share the news themselves over the Internet.

*Paul Sagan
& Tom
Leighton
on the
future
of news*

While the Internet has already created massive dislocation in other forms of media – recorded music, most significantly – its full impact on news media remains to be seen. A key distinguishing factor in the future evolution of news media driven by the Internet will be the coming growth in high-quality video available over the Internet to personal computers, mobile devices, and, ultimately, large-screen TVs in nearly every household. TV and Internet usage are rising together, and viewers who watch news on both TV and the Internet watch more news than viewers who use only TV or the Internet.[3] This trend reveals the true power of the coming convergence of TV-quality video and the Internet. Integrated experiences that weave together news video accessed over the Internet into more and more of our lives will help to drive dramatic changes in journalism and the news media.

The Internet is not simply reaching more people each day; it is reaching them at faster speeds – so quickly, in fact, that the definition of "broadband" itself is changing. The Federal Communications Commission (FCC) currently defines broadband connections as those that enable data transfer speeds of more than 200 kilobits per second (Kbps), about four times faster than the fastest dial-up modems. However, what not long ago was considered "high speed" is now merely sluggish: TV-quality video streams require connection speeds about *ten times faster* than the FCC's definition of broadband.

Today, more than half of all users worldwide have Internet connections that can support TV-quality video, and roughly one-fifth have connections capable of supporting DVD-quality video, which requires more than twice the speed of TV-quality streams.[4] Moreover, both broadband penetration and speed are expected to continue growing rapidly even in the current economic climate, as many governments around the world have prioritized investing in Internet infrastructure as critical to economic development.

As key news audiences now regularly blend online with traditional news sources, broadband adoption has been instrumental in fueling a new era of news consumption. Multiple news sites, videos, archived stories, and searchable terms are all at one's disposal with an immediacy never experienced before in history. Broadband infrastructure is enabling fast access to content, and has created a world where news is no longer a finite product that arrives at your doorstep once a day, or is broadcast into your home each evening. Rather, news has become an infinite, continual source that can be accessed on demand.

The Akamai Net Usage Index for News,[5] which monitors aggregate Web traffic generated at more than a hundred global breaking-news websites, shows that when news occurs, the Internet serves as a primary means for seeking information because of its accessibility, convenience, breadth of data, and ability for the end user to control the specificity and customization of the news. Since consuming news is such a big part of people's daily lives, tracking where news is consumed and which news stories attract the most online attention are critical measurements in determining a variety of geographic and sociological trends. Some examples include:

- The Internet is much more likely to be the main source of news during working hours on a weekday versus news

breaking on a weekend. This is a direct result of a workforce highly dependent on the PC.

- Sporting events continue to be galvanizing news stories, generating some of the highest peaks in online news traffic as eager fans follow competitions in real time.

- Anticipatory news events, such as verdicts, election returns, or other rapidly changing outcomes cause a "refresh phenomenon," and thus high levels of Web traffic. Online news audiences continue to refresh their Web browsers or visit multiple news sites to get minute-by-minute coverage.

As quickly as wired broadband is advancing, wireless broadband is growing even faster. Today's news audience is used to the idea of accessing the Internet, untethered, from anywhere and everywhere – in coffee shops, on airplanes, on their iPhones, or via personal hotspots (powered by cellular modem). In the United States, the number of subscribers with broadband access on their smartphones jumped by a multiple of twenty-four, from three million in 2006 to seventy-three million in 2008, driven by the explosive popularity of the iPhone and other smartphones.[6] With 250 million broadband mobile subscribers worldwide, mobile data traffic is expected to continue its exponential growth, doubling every year through 2013.[7] Meanwhile, new fourth-generation (4G) network technologies offer the potential to combine faster-than-WiFi speeds with cell-network breadth of coverage.

These faster access speeds won't simply mean greater data consumption; they offer the possibility of entirely new types of interactions and innovative applications, as users connect meaning-fully to the Web with highly personal devices that are always with them. Many of today's most popular Web properties, from social networks to commerce to video and news sites, would never have flourished without high levels of (wired) broadband accessibility. The widespread adoption of wireless broadband on today's smartphones changes the game yet again, with implications that we are just beginning to understand.

Consider the remarkable water landing of U.S. Airways Flight 1549 on the Hudson River. Mobile devices connecting to the Web were among the first tools to publish photographs as well as upload accounts to micro-blogging site Twitter about the heroic efforts of the crew and rescuers.[8] These digital assets from non-journalists were used by mainstream media, demonstrating the potential role of every individual with a mobile device when news breaks.

Perhaps the biggest trend in Internet growth today is the juggernaut of online video and its potential to impact journalism. Ten years ago, the biggest application on the Internet was email. Today it is video, an application that is set to become the primary media platform of the future.

The growth in Web traffic associated with news coverage of the last three U.S. presidential elections sheds some light on just how far both the Internet and online video have grown in less than a decade. One of the world's leading online news sites delivered more than one hundred million page views during a twenty-four-hour period on Election Day 2000. That same site delivered more than 670 million page views on Election Day 2004. Live, online video coverage of the respective inaugurations from each of those elections was nonexistent, as news sites

*Paul Sagan
& Tom
Leighton
on the
future
of news*

were still adopting live streaming solutions and broadband infrastructure was just beginning to grow.

Fast-forward to November 2008, when President Obama's election-night victory drove record-breaking traffic across news sites measured by the Akamai Net Usage Index for News. Traffic to these sites peaked at a record of more than 8.5 million visitors *per minute* worldwide. The number of television watchers also reached historic heights, at 71.5 million, compared to roughly 60 million in 2000 and 2004. President Obama's inauguration in January 2009 broke more records, as the Akamai global content delivery network served more than seven million simultaneous streams at approximately 12:15 p.m. ET during the inauguration, a number that rivals the audience for many televised cable channels.

By the end of 2008, nearly three-fourths of Internet users watched videos online at least monthly. But even more telling is the dramatic rise in the number of videos watched, a large part being news videos. Tracking firm comScore reports an 81 percent jump in the number of videos per viewer between June 2008 and 2009, with 19.5 billion clips watched by more than 157 million people in the United States in June 2009 alone. Notably, comScore attributes a surge in video viewership that month primarily to interest in the death of Michael Jackson.

Several technological innovations over the last few years have brought about this rapid-fire growth in online video. First, online video became cheaper and easier to *consume*. Today, watching a video is a simple, one-click process, using video players seamlessly embedded within Web pages. Moreover, it no longer takes an expensive piece of hardware to do so: not only have PCs and laptops dropped in price, but

netbooks and cell phones now make it possible to watch Internet video with a $300 device. This new affordability, combined with the near-ubiquity of wired and wireless broadband, has made it easy to consume video, anytime, anywhere.

At the same time, videos have become far cheaper to *produce*, no longer an expensive proposition restricted to the dominion of big studios. Today, anyone with a webcam or cell phone not only can record videos and make them accessible to the world, but also can stream video live via sites like ustream.tv and qik.com. It is the era of the citizen journalist, the citizen filmmaker. Indeed, with cell phones often present where larger video cameras are not, amateur cell phone footage has made its way into many mainstream news stories: the 2005 London train bombings, Saddam Hussein's execution, and the recent protests in Iran, for example.

The Internet has also made videos cheaper and easier to *distribute*, with paradigm-shifting economics that enable a viable distribution platform not only for blockbuster hits, but also for a long tail of media targeted to niche interests. The Web's social platforms and communities also play a key role by making it easier for media to find its audiences and vice versa, multiplying the power of word-of-mouth by hundreds, thousands, even millions.

Finally, the Internet has made video much easier to *share*, as the Web's wide reach, combined with its highly interconnected, highly social nature, enables online media to reach an unprecedented number of viewers within a very short time. The most viral video to date, Susan Boyle's performance on *Britain's Got Talent*, surpassed 170 million views within a few short weeks. In comparison, note that all three major TV net-

works *combined* reach just under twenty-three million viewers each night for the evening news.

The current momentum in online video is toward longer, higher quality content, evidenced by the enormous growth in the last year of long-form sites such as Hulu.com and the sites of major network TV channels. The fast-growing success of Hulu and other long-form sites points clearly to the convergence of TV and PC – and, more generally, to the convergence of all types of media and communications devices. We can now watch TV shows from our phone, make video calls from our computers, and surf the Web from our gaming consoles.

This convergence, in turn, drives continual demand for higher video quality. More than half of all U.S. households currently own at least one HD (high-definition) television, and the number of HDTV households worldwide is forecast to grow anywhere from 20 percent to 30 percent each year over the next several years.[9] Web-enabled media devices – including televisions, gaming consoles, Blu-ray disc players, and set-top boxes such as Netflix Roku and Apple TV – now bring Internet video direct to the living room. As these screens continue to grow in size and connect ever more effortlessly to the PC and the Web, the Internet becomes the imminent platform of choice, and HD video the medium of choice for all forms of media, including news.

The year 2008 saw a significant jump from 24 percent to 40 percent of Americans using the Internet as their primary source of national and international news. Notably, for those in the 18 – 29 age group, the Internet saw an even bigger jump of 25 percentage points, rivaling television for the first time as a primary source of news.[10] This trend will continue to accelerate as high-quality video becomes more readily available for a growing number of devices.

The resulting explosion in online data is not without its challenges, particularly in terms of infrastructure. The scale is almost unfathomable: the Internet Innovation Alliance estimates that by 2010, the amount of bandwidth consumed by twenty U.S. households will be greater than that of the entire Internet in 1995. And the numbers will continue to grow exponentially. For example, in the near future, we can imagine the capability to deliver video events over the Internet to audiences comparable in size to television's Super Bowl audience. However, the bandwidth requirements to deliver a TV-quality event to such an audience are a couple of orders of magnitude greater than that of current Internet video traffic. Realization of the numbers involved has led to several high-profile reports and commentary in recent years indicating that the Internet's infrastructure will not be able to handle video's onslaught.

To understand the challenges inherent in supporting this level of traffic, we need to understand how the Internet works. Although it is commonly referred to as a single entity, the Internet is composed of more than thirteen thousand smaller, competing networks. Each network provides Internet access for a set of users and possibly a set of websites. It also provides the ability to transfer data across its own network as well as connection points to exchange data with a number of other networks.

Because the Internet is made up of so many different networks, a user visiting a website or watching an online video is almost always accessing content that lives on a different network than his own. That content typically must travel across multiple networks in order to reach the end user.

*Paul Sagan
& Tom
Leighton
on the
future
of news*

Unfortunately, the connection points between these networks tend to be underprovisioned and extremely congested – a reality dictated by the long-standing economics of the industry. Networks get revenue by providing Internet access to users and to websites, not by exchanging data with each other. This sharply limits the effective bandwidth between any single network and the Internet audience at large. A network has no control over the many thousands of other networks and connection points it relies on to deliver its data to Internet users around the world. As a result, calculations show that no video hosted on one, two, or even a dozen networks can come anywhere close to supporting a Super Bowl-sized online audience.[11]

This does not mean that the scale we are looking for is unachievable, however. The capacity is there, but only at the edges of the Internet, where users connect to their networks. Over the years of Internet growth, the Internet "edge" has seen continued capacity build out, as networks like Verizon FiOS and Comcast Cable have aggressively continued upgrading and offering faster connection speeds in order to expand their user base and revenues. A highly distributed video delivery infrastructure that leverages the capacity of these last-mile networks is the way – the only way – to achieve the scale that video demands. This type of infrastructure, in which video servers are deployed within thousands of different networks, allows popular content to be delivered to users directly from within their own network, avoiding the Internet's many chokepoints.

Similarly, such an architecture is the only viable way to handle the highly variable and unpredictable levels of traffic that news events in particular can generate. Michael Jackson's death, for exam-

ple, brought down some of the Web's most popular properties, including Google, Twitter, and Wikipedia, due to the unprecedented surge in interest in the hours and days after the news broke. A massive, highly distributed infrastructure is far more resilient to these instantaneous surges in demand.

Achieving desirable video quality online presents another challenge. As connection speeds go up, more and more users are demanding higher quality DVD or HD video. However, it turns out that because of the way Internet protocols work, the streaming speeds necessary for high-quality video are not achievable unless the server is *geographically close* to the end user. Once again, this points to the critical importance of a highly distributed infrastructure in realizing online video's potential.

Other new technologies will also play an important role. *Adaptive streaming*, for example, seamlessly adjusts a video stream based on changing, real-time Internet conditions, minimizing wait time while delivering the best possible stream quality given current conditions. Another innovation is *stream transcoding*, which transforms a video stream on-the-fly to display optimally depending on the device used to watch it – whether it be a cell phone, PC, or large-screen HDTV. Last, but not least, industry adoption of open standards and platforms will be critical to accelerate user adoption and technological innovation, as well as to enable the massive scale in infrastructure that video portends.

Fortunately, all of these key technological advances have recently fallen into place, allowing us to carry forward the momentum online video has gathered and push it past its tipping point into a revolutionary new era. As current trends in broadband, wireless, and

online video growth continue to fuel the Internet's progress, the pace of innovation will continue to accelerate. Ultimately, the seamless integration of real-time, interactive, TV-quality video into every aspect of our daily lives will have an impact on news – and on society as a whole – that is far broader and more transformative than we can even begin to imagine today.

ENDNOTES

[1] Irving Fang and Ann Norris, *The Story of Communication*, vol. 11, *Internet* (St. Paul, Minn.: Rada Press, 2005).

[2] Estimated number of Internet users in 2013 comes from Forrester Research, July 2009, http://www.forrester.com/ER/Press/Release/0,1769,1296,00.html.

[3] http://en-us.nielsen.com/main/insights/consumer_insight/april_2009/media_is_on _demand, http://en-us.nielsen.com/main/insights/consumer_insight/june_2009/ capitalize_on_your.

[4] Based on data collected by the Akamai network, which is responsible for delivering approximately 20 percent of all Web traffic. See Akamai's *State of the Internet, 1st Quarter 2009.*

[5] http://www.akamai.com/html/technology/nui/news/index.html.

[6] Grant Gross, "US Broadband Ranking: Does it Matter?" nytimes.com, June 5, 2009.

[7] Cisco Visual Networking Index, *Global Mobile Data Traffic Forecast Update*, January 2009, http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/ white_paper_c11-520862.html.

[8] http://www.editorsweblog.org/multimedia/2009/01/twitter_first_off_the_mark _with_hudson_p.php.

[9] Cable & Telecommunications Association for Marketing, *Pulse Report*, June/July 2009, http://www.ctam.com/html/news/releases/090804.htm.

[10] Pew Research for the People and the Press, December 23, 2008, http://people-press .org/report/479/internet-overtakes-newspapers-as-news-source.

[11] This complex problem is explored in greater depth in the white paper "How Will the Internet Scale?" available at www.akamai.com/whytheedge.