

How Did Twitter Revolutionize Online Communications?

Just by reading this article online, you're using a disruptive technology. Double points if you're reading it on a smartphone or tablet.

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The term disruptive innovation was brought into the lexicon by Clayton M. Christensen in his book "The Innovator's Dilemma," in the context of businesses adopting technologies that eventually completely surpass or replace previous technologies, possibly harming whichever business backed the wrong technology. A disruptive technology is something new that disrupts an industry, and quite often completely changes the way we all do things.

The car disrupted the horse and carriage industries. Small personal computers have given individuals computing power that only used to be possible via the huge mainframes that crunched numbers exclusively in corporate, academic and government institutions. Computers and all the things that have come along with them have wreaked havoc in any number of industries. Even on a smaller scale, individual components of home computers have gone through cycles of disruption, such as the evolution of the various sorts of storage media (think floppy drives to CDs to flash drives), and the move from desktop computers to more portable laptops to even smaller mobile devices. They might cause disruption by being cheap or simple enough for mass adoption, and then, as is the case with most computing devices, they grow faster, more powerful and better over time. There is the common refrain of consumers not even knowing they needed something until it was brought into being, and that's true of many disruptive technologies.

Here are 10 disruptive technologies that many people are now using on a regular basis. We may be able to recall their predecessors fondly, but we probably don't really miss them very much.

Social Media

Streaming Media Services

E-Readers and E-Reader Apps

Smart Mobile Devices

Mobile Payment Options

Self-checkout Stations

Wearable Fitness Devices

Cloud Computing

The Internet

10: E-mail

Can you remember how you communicated with friends, relatives and business associates before e-mail?

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Sending digital messages from computer to computer began over ARPANET, the beginning of our modern Internet, in the early 1970s. The average person didn't gain access until the 1990s or later. But now pretty much everyone has an e-mail address, possibly several. It's a quick and easy method of communication that's put a dent in personal letter writing, phone conversation and face-to-face meetings. The nearly instantaneous nature of e-mail and other digital communication methods have made communication over a distance far easier than it used to be, and has led many people to call traditional physical correspondence "snail mail." There's even an e-mail version of junk physical mail: spam.

Emailing is cheaper and easier than hand writing letters in a lot of ways. There's no postage, paper or ink to buy. Hitting the send button takes much less effort than stamping and mailing a letter. The typical home in the U.S. apparently received a letter every two weeks in 1987, but it was down to once every seven weeks in 2010, not counting greeting cards or invitations [source: Schmid]. But even invitations and greeting cards have going digital. According to a 2011 Pew Internet survey, at that time 92 percent of adults in the U.S. who got online used e-mail, 61 percent of them used it on a typical day and 70 percent of all Americans used e-mail to some extent [source: Purcell]. Just about anyone who works on a computer has a work e-mail via which they correspond with coworkers or clients, send documents, set up meetings and the like. Even at home, we're not just sending the equivalent of the long letters of yore. We are sending quick questions, links to websites, and attach documents, pictures, music and video files.

Much of the novelty of e-mail has diminished, and quick communication is now increasingly taking place via phone text messages, instant messaging and social media.

9: Social Media

How did people ever survive without constantly sharing pictures of their food and pets?

Image by HowStuffWorks staff

Social networking sites facilitate social interaction and information sharing among friends, acquaintances or even strangers over the Internet. They usually allow you to post text statuses, links, images or videos that are either accessible by anyone with access to the site or only to private groups of friends. They often incorporate the ability to send private

messages, and many now also include instant messaging and video chat features. Major social media sites include Facebook, Google+, MySpace, Tumblr, LinkedIn, and Twitter, among others. Facebook has more than 1 billion users, making it the largest social networking site, but there are lots of others with millions or hundreds of millions of users [sources: Adler, Berkman]. For some people, social networking has taken the place of e-mail, texting, the phone and even face-to-face interaction.

As of early 2013, more than half of the people who use the Internet also regularly use social media [source: Berkman]. The numbers in the U.S. are higher, at around 74 percent as of January 2014 [source: Pew Research Internet Project]. Social sites are becoming the main avenues of communication for some of us, or at least the ones on which we spend the most time. A 2013 Experian study found that people in the U.S were spending 16 minutes of every hour on social networking sites, on average, through both personal computers and mobile devices [source: Gaudin]. And a study in the U.K. in 2010 found that a quarter of people spent more time socializing via social networks than in person, and that 11 percent of adults would eschew in-person social events in favor of social media, e-mail, texting and the like [sources: Fowlkes, Telegraph]. Those numbers are likely to continue to grow. In other words, we're losing things like tone of voice and body language, at least when we communicate using only text. This leaves us with lots of potential for miscommunication and even willful misrepresentation, which is bad for building solid relationships with people.

Social networking is reportedly also altering journalism. We're getting more and more of our news via links posted on social networks and some stories are even breaking online first. Everyday citizens sometimes capture news on their cell phone cameras as it's happening or post eyewitness accounts of an event, and these get picked up by more traditional media after the fact. News organizations have had to join Twitter and Facebook and other sites, and they're now competing against bloggers and other amateur journalists for users' attention online.

Social networking sites are allowing us to reconnect with long lost friends, raise money and awareness for charities, get involved in politics (or, maybe more often, get into political arguments), share experiences and widen our real-world network of friends and acquaintances. We just might want to put in some in-person face time with some of them, too.

8: Streaming Media Services

Watching movies online through services such as Netflix is part of everyday life, much to the chagrin of cable and satellite TV providers.

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In 2013, Michael Powell, the head of the National Cable & Telecommunications Association, stated in a Senate hearing that Netflix was the largest subscription video provider in the U.S.,

not cable or satellite [sources: Eggerton, Komando]. Netflix actually began as a DVD-by-mail service, then moved to streaming and still provides both services. Netflix is also often credited with driving video rental giant Blockbuster to bankruptcy and closure. Blockbuster now exists as a streaming site and an on-demand service of Dish Network.

There are other major streaming sites, including Hulu and Amazon Instant Video; video sharing site YouTube; TV channel sites such as HBO Go and Watch ABC; services that allow you to rent movies and TV shows, such as Google Play, iTunes and Vudu; and Redbox, which offers both online streaming and DVD rentals at special vending-machine-like kiosks. If you aren't tied to any shows that require a cable or satellite subscription, you might be able to give up cable and partake of the many thousands of hours of entertainment from which to choose online. Lots of people who stream keep their cable or satellite subscriptions, however. Streaming services, including Netflix and Amazon, are starting to develop and offer their own original programming, too.

Music has gone through a similar shift, with CDs being supplanted over time by digital downloads, starting with the inception of MP3 compression and music sharing (or pirating) sites like Napster, then moving to paid digital downloads from sites like iTunes and Google Play and now unlimited music streaming through services such as Pandora and Spotify.

You can consume streaming video and audio through apps on your smart TV, DVD player, gaming console, computer and even your phone or tablet. There are also dedicated streaming set-top boxes, like the Roku, which allows you to download more than a thousand streaming apps, including most of the major players plus a lot of small niche channels. Other choices include the Boxee box and Apple TV, and small flash drive sized HDMI sticks such as the Google Chromecast and the Roku Streaming Stick.

7: E-Readers and E-Reader Apps

You could never tote around as many physical books at once as you can keep on your e-reader.

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E-Readers like the Amazon Kindle, the Barnes & Noble Nook and the Kobo Glo have taken a chunk out of the market for paper books. Most of them feature high-resolution black text on a white or slightly gray page for comfortable reading, and a few incorporate lighting so that you don't have to read by daylight or lamplight. Some advantages of e-books are that they tend to be at least a little bit cheaper than their paper counterparts, and you can carry dozens or hundreds of them with you on an e-reader. Libraries are even offering e-book checkout in some cases. E-readers also allow you to download and read newspapers, magazines and comics. And some of them will let you listen to an audio version of a book while you are reading.

But now that so many people carry smartphones and have tablets, the dedicated e-readers themselves are not necessary for switching to e-books. There are e-reader apps, like Kindle, Stanza and Apple's iBooks, through which you can order and read digital books on your mobile device or computer. Some even allow you to bypass downloads and read your books in the cloud. Kindle also makes its own multi-use color tablet, the Kindle Fire, that makes it easy to buy and read books, but also to do anything else you can on just about any other tablet. Some people prefer the look and feel of a paper book and aren't likely to switch. Per a survey by Princeton Survey Research Associates International in early 2014, 69 percent of adults read at least one paper book in the previous year, 28 percent read at least one e-book and 14 percent listened to at least one audiobook. Some people use all three formats, although 4 percent of readers stick exclusively with e-books [source: Zickuhr and Rainie].

6: Smart Mobile Devices

Mobile devices catalyzed a major shift in the way most people live their lives.

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Smartphones and tablets allow us to access the Internet from nearly anywhere, essentially letting us carry around the bulk of human knowledge in our pockets, or at least a tool to get to that knowledge. They are beginning to replace a great many things we formerly used all the time, and are introducing us to services that never existed before. Phone apps let you check email, play games, surf the net, create text documents, access product reviews, find directions and identify music that is playing at your location, among a great many other things. These highly portable devices can act as music players, cameras, GPS devices, video viewers and e-readers. With the built in calendar, to-do list, dictation and voice activated personal assistant programs, they could begin to reduce the need for live assistants. And how many people wear watches these days?

Smartphones with cameras have already taken a bite out of the consumer camera market. The higher end smartphones have resolutions and other capabilities that rival many digital cameras on the market. A study from 2011 found that even then, people were using their smartphones for more than half of their spur of the moment photos, although they were a little more likely to use a dedicated camera for vacation shots [source: Donegan].

Smartphones also have the added bonus of allowing us to quickly share our photos and videos on social networking sites, and there are even photo editing apps so you can tweak and retouch your image before you upload it. Mobile devices are also allowing the Internet to reach areas in developing nations where it would be cost prohibitive to get traditional online service to the home.

As their processors get more powerful and cellular Internet connections get faster, both smartphones and tablets are replacing laptops and desktop computers as peoples' day to day computing devices. They have already become more powerful than a lot of our old laptops from years ago, they don't require as much power, and 3G and 4G cellular networks

and WiFi connectivity have brought them faster broadband speeds.

They can also be used for word processing and accessing business related sites on the road, although their small screens and slower processors don't make them ideal for some business uses.

You can also use your smartphone or tablet as a remote control for a myriad of devices, such as gaming systems and video streaming devices. You can even buy infrared (IR) devices that work with mobile device apps so that you can control your TV and other hardware that usually requires an IR remote.

Smartphones, too, might share some of the blame for reducing in person communication. It's what many of us are using to check e-mail and surf social media sites, after all, even sometimes when we're out with friends or family.

Sales of smartphones surpassed sales of laptops in 2007 [source:], and surpassed sales of personal computers in general in late 2010 [sources: Wingfield, Arthur]. Laptops and desktops are still necessary for certain types of computing, but there could be a day when you're just as likely to plug your phone into a keyboard and monitor as crack open a laptop.

Smartphones and tablets are also playing a major role in our next disruptive technology.

5: Mobile Payment Options

Signing for your purchases on a mobile device's touchscreen is likely to become progressively more common.

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Mobile apps and services are coming along to disrupt the traditional cash register. The path for moving away from the register was paved in part by the near abandonment of cash as our primary payment method. Per a Nielsen survey released in January 2014, 54 percent of people around the world and 71 percent in North America prefer plastic to cash for their daily spending [source: Nielsen]. We are also increasingly willing to make online purchases with credit and debit cards, including shopping on smartphones and tablets. These developments, along with the advent of touchscreen mobile devices and relatively easy access to the reliable broadband Internet connectivity, have made in-store smartphone and mobile-based payment systems a reality.

Major contenders in the mobile payment arena are Square, Intuit GoPayment, Pay AnyWhere, ShopKeep and even PayPal with PayPal Here (which lets you take credit cards and scan checks for deposit into your PayPal account). Some simply consist of an app on your device and a tiny card reader plugged into its audio jack. This gives even the smallest independent store or street vendor the ability to take credit cards. Retailers are charged a percentage per transaction, a monthly fee or both, along with the cost of the hardware, which

is much cheaper than traditional registers and card readers. Square also offers a stand that connects to an iPad, bar-code scanner, receipt printer and related devices for a more robust cash register replacement. Mobile devices themselves have cameras that allow them to scan barcodes. Employees might be wandering the store with mobile devices, able to help customers anywhere. Tablets are even appearing at tables in restaurants to allow you to order items and pay with a swipe. Some companies, including Wal-Mart, have experimented with letting people check out entirely on their own mobile devices using apps that let them ring up merchandise. Such innovations could potentially be the death of waiting in line, although it could also reduce jobs.

Phones that incorporate Near Field Communications (NFC) allow you to pay for things without your physical credit or debit cards at NFC-enabled payment stations using apps such as Google Wallet. Online payment methods like PayPal are even being accepted at some stores, and for places that can't process PayPal payments, the service can issue users a debit card.

NCR and other cash register manufacturers may not have to worry about extinction, however, due to the rising popularity of the next item.

4: Self-checkout Stations

Self-checkout is appealing to people who are more comfortable skipping human interaction.

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One technology that's becoming quite common in grocery stores and other large retail establishments is the self-checkout station. These usually consist of four or more kiosks, each with a scanner, a touchscreen monitor, a card reader, slots for taking and dispensing cash and areas on which to bag or place your purchases. There's generally one worker overseeing a few kiosks, and the customer does the rest -- scanning items, typing in the codes of produce and bagging the groceries. If something goes wrong, the worker will be signaled to come and help so that the transaction can go forward.

There's concern that self-checkout will lead to job losses for some of the millions of cashiers in the U.S. -- there were around 3 million in 2013 [sources: Bureau of Labor Statistics, Thibodeau]. This is an issue that comes up whenever something is automated and only time will tell if they take a major toll on the job market or simply shift workers into other jobs. But some stores are giving them up due to customer service and job loss concerns, including the grocery chain Albertsons. Many people prefer to deal with a human being, although some prefer self-checkout. As an anti-theft measure, many of the systems weigh or otherwise sense the items you've put in the bagging area and check that against what you scanned. Of course, thieves will try tricks like weighing non-produce items as produce in an effort to sneak away with product. Some theft risk can be reduced with video monitoring software that can quickly alert a staff member to perceived wrongdoing, or conveyor systems that scan items

quickly and automatically, making it harder for would-be shoplifters to slip things by the scanners.

Advantages include shorter lines and quicker checkout times, at least provided there are no complications. Ikea has actually opted to remove them from stores in the U.S. because they were causing longer checkout times due the difficulty most people had getting their items to scan.

But these kiosks are becoming more and more prevalent, and will likely improve over time. One expected improvement is scanners that actually recognize your purchases rather than relying on barcodes or keyed-in product codes.

3: Wearable Fitness Devices

The Misfit Shine is one of many wearable devices available for tracking your physical activity.

© Ethan Miller/Getty Images

Fitness and lifestyle trackers are all the rage, and there are many to choose from, including the Fitbit, the Nike Fuelband, the Adidas Fit Smart, the Samsung Gear Fit, the Misfit Shine and the Jawbone Up, among many others. They do things like track your workout time, steps (like a pedometer), distance and calories burned, as well as measure your heart rate and monitor your sleep patterns. Some work in conjunction with apps on your smartphone or an online portal where you can track your data, set your goals and possibly do things like log dietary information.

The devices and apps can use the gathered data to cue you to increase or decrease your workout intensity, let you share data with other users for accountability and motivation and, in the cast of at least one company (GOQii), get you in touch with an experienced fitness coach who monitors your data, sends advice and responds to questions (for a recurring fee). They may have small screens, LED status lights or no display at all. Some require plugging in to upload your data and some sync wirelessly and automatically. Some work with only one operating system while others work with several.

Many modern smartphones even have sensors now that allow phone apps to perform some of these functions, like tracking your routes or your steps. Some even have heart rate checking capabilities.

These or similar innovations could disrupt personal training and other fitness related jobs, although there are some things a wearable device or app are not going to be able to do, like make sure you're using good form -- at least for now.

2: Cloud Computing

Cloud computing does not involve any actual clouds.

The cloud is made up of large groups of powerful computers called servers. They're usually housed in data centers or computer rooms, and these centers are running software that can distribute processing over their network across multiple servers. Users access cloud services remotely via their own web browsers. In fact, you could consider anything you can get to on the Internet to be in the cloud, since you're accessing the data on a remote server. And a lot of the media you're streaming these days is in the cloud.

The advent of cloud computing gives businesses the potential to quickly increase their processing capabilities without having to buy equipment or hire and train new staff, and often at lower cost than in-house IT expansion would require. Companies simply pay a host for whatever type of access and services they need. These types of services also mean that smaller businesses and startups that never would have been able to raise the capital to buy heavy-duty equipment and the necessary staff can gain quick access to computing power. Cloud computing is altering the way we consume and purchase business software and hardware. Having lots of your data in the cloud also allows data mining for business analytics.

You don't have to be a business to utilize the cloud. The wide availability of inexpensive broadband connectivity means many of us are always online and able to access data much more quickly than in the days of dial-up. You may already be using an online e-mail service like Gmail or Hotmail, online office software like Google Docs, or storing your photos, videos or documents on storage sites like DropBox, and you just didn't know to call it the cloud.

Storage space used to be expensive, but it's getting cheaper and cheaper. Many cloud services will give you several gigabytes of storage for free and charge you annual or monthly fees if you need more space. Anything that you store on them can be accessed from multiple devices and from any location with an Internet connection. It also makes it easy for people to travel light, or to share data with others.

Our always-on connectivity, along with a shift to downloadable software (also made possible by cloud storage), is allowing us to swap our heavier desktop and laptop computers for smaller, cheaper devices with less storage like netbooks, tablets and even phones. We can get to all our data online.

Possible drawbacks to moving things off of a local hard drive are the security of personal information, loss of data if something goes wrong (say your cloud provider goes under) and loss of access when you have connectivity issues. But physical hard drives can be lost, as well. The best solution is to keep anything you don't want to lose in more than one location, and that makes the cloud a good backup solution. If a computer or physical hard drive fails, the information can be downloaded from your cloud service to new devices.

Many of our phones now automatically sync our data to a cloud account so that we never have to worry about plugging them into our computers to upload or download data. If your phone is lost or stolen, in many cases you can wipe its data remotely and then reinstall everything easily onto a replacement.

1: The Internet

Tim Berners-Lee, inventor of the World Wide Web, speaking at the 2013 SXSW Music, Film + Interactive Festival.

© Amy E. Price/Getty Images for SXSW

The Internet began in 1969 as ARPANET, a method to link computers together for data sharing developed by the Department of Defense's Advanced Research Projects Agency (ARPA). The development of the World Wide Web (the Internet as we know it) began in 1989 as a project by British scientist Tim Berners-Lee. In 1994, not long after the birth of the web, only 11 million people were online. By 2014, billions of people were on the Internet [sources: Berkman, Pew Internet Research Project]. With high-speed broadband connections at home and cellular data on a lot of our phones, many people are essentially always online.

The Internet has made most of the previously mentioned disruptions possible and then some. We have access to vast amounts of human knowledge through web browsers and search engines, along with incredible communication and information sharing tools. We can make Voice over IP (VoIP) calls, do video chat, instant message and send e-mail, all nearly instantaneously.

The Internet is transforming retail with online purchasing and mobile payment, education with online classes and our consumption of entertainment with media streaming, online gaming and downloadable e-books.

There are even some upsides that have job loss related downsides. People are booking travel themselves instead of using travel agents, doing their banking online instead of going to the bank, buying stocks online instead of consulting a broker and sending e-mail instead of posting letters. Brick-and-mortar retail store sales have suffered and now most also have their own online retail presences. People get most of their news online, leading to declines in newspaper and magazine subscriptions. Even serious news sites have blogs and social media accounts that link back to their articles.

You can pay your bills all at once from a single financial institution's website. The percentage of bills paid by traditional mail dropped below 50 percent in 2010, according to the US Postal Service [source: Schmid]. You can even pay for print postage from an online site for any physical items you do have to send through the mail and just drop them off at the post office or hand them to your mail carrier.

Our online access allows some of us to telecommute instead of driving to work, leading to

changes in traditional workspaces and work practices. Video conferencing at work is more and more common. On the flip side, the Internet also makes it easy to check personal e-mail, peruse retail sites, post on social networking sites and otherwise goof off while we're at the office.

The Internet has transformed advertising, as well as and charitable and political fundraising. Any company or non-profit entity that wants to be taken seriously needs to have a website and a presence on the major social media sites, and even in TV and print ads, you might see Twitter, Facebook and other social network logos.

The so-called Internet of things, involving lots of gadgets that can wirelessly send data, is making the connected home a real thing. We're beginning to be able to control home appliances and monitoring devices from our phones while we're away from our domiciles. At this point, there's no limit to the possibilities that the Internet will bring in the future.

What's a disruptive technology?

10 Sneaky Ways Technology Betrays Cheating Cheaters

How 3-D Printing Works

How KickStarter Works

How did Twitter revolutionize online communications?

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