

# IBM reveals five innovations that will change our lives in the next five years (Update)

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Today IBM formally unveiled the sixth annual “IBM 5 in 5” (#ibm5in5) – a list of innovations that have the potential to change the way people work, live and interact during the next five years.

The next IBM 5 in 5 is based on market and societal trends as well as emerging technologies from IBM’s research labs around the world that can make these transformations possible.

## **People power will come to life.**

Anything that moves or produces heat has the potential to create energy that can be captured. Walking. Jogging. Bicycling. The heat from your computer. Even the water flowing through your pipes.

Advances in renewable energy technology will allow individuals to collect this kinetic energy, which now goes to waste, and use it to help power our homes, offices and cities.

Imagine attaching small devices to the spokes on your bicycle wheels that recharge batteries as you pedal along. You will have the satisfaction of not only getting to where you want to go, but at the same time powering some of the lights in your home.

Created energy comes in all shapes and forms and from anything around us. IBM scientists in Ireland are looking at ways to understand and minimize the environmental impact of converting ocean wave energy

into electricity.

## **You will never need a password again.**

Your biological makeup is the key to your individual identity, and soon, it will become the key to safeguarding it.

You will no longer need to create, track or remember multiple passwords for various log-ins. Imagine you will be able to walk up to an ATM machine to securely withdraw money by simply speaking your name or looking into a tiny sensor that can recognize the unique patterns in the retina of your eye. Or by doing the same, you can check your account balance on your mobile phone or tablet.

Each person has a unique biological identity and behind all that is data. Biometric data – facial definitions, retinal scans and voice files – will be composited through software to build your DNA unique online password.

Referred to as multi-factor biometrics, smarter systems will be able to use this information in real-time to make sure whenever someone is attempting to access your information, it matches your unique biometric profile and the attempt is authorized. To be trusted, such systems should enable you to opt in or out of whatever information you choose to provide.

## **Mind reading is no longer science fiction**

From Houdini to Skywalker to X-Men, mind reading has merely been "wishful thinking" for science fiction fans for decades, but their wish may soon come true.

IBM scientists are among those researching how to link your brain to your devices, such as a computer or a smartphone. If you just need to think about calling someone, it happens. Or you can control the cursor on a computer screen just by thinking about where you want to move it.

Scientists in the field of bioinformatics have designed headsets with advanced sensors to read electrical brain activity that can recognize facial expressions, excitement and concentration levels, and thoughts of a person without them physically taking any actions.

Within 5 years, we will begin to see early applications of this technology in the gaming and entertainment industry. Furthermore, doctors could use the technology to test brain patterns, possibly even assist in rehabilitation from strokes and to help in understanding brain disorders, such as autism. .

## **The digital divide will cease to exist.**

In our global society, growth and wealth of economies are increasingly decided by the level of access to information. And in five years, the gap between information haves and have-nots will narrow considerably due to advances in mobile technology.

There are 7 billion people inhabiting the world today. In five years there will be 5.6 billion mobile devices sold – which means 80% of the current global population would each have a mobile device.

As it becomes cheaper to own a mobile phone, people without a lot of spending power will be able to do much more than they can today.

For example, in India, using speech technology and mobile devices, IBM enabled rural villagers who were illiterate to pass along information through recorded messages on their phones. With access to information

that was not there before, villagers could check weather reports for help them decide when to fertilize crops, know when doctors were coming into town, and find the best prices for their crops or merchandise.

Growing communities will be able to use mobile technology to provide access to essential information and better serve people with new solutions and business models such as mobile commerce and remote healthcare.

## **Junk mail will become priority mail.**

Think about how often we're flooded with advertisements we consider to be irrelevant or unwanted. It may not be that way for long.

In five years, unsolicited advertisements may feel so personalized and relevant it may seem spam is dead. At the same time, spam filters will be so precise you'll never be bothered by unwanted sales pitches again.

Imagine if tickets to your favorite band are put on hold for you the moment they became available, and for the one night of the week that is free on your calendar. Through alerts direct to you, you'll be able to purchase tickets instantly from your mobile device. Or imagine being notified that a snow storm is about to affect your travel plans and you might want to re-route your flight?

IBM is developing technology that uses real-time analytics to make sense and integrate data from across all the facets of your life such as your social networks and online preferences to present and recommend information that is only useful to you.

From news, to sports, to politics, you'll trust the technology will know what you want, so you can decide what to do with it.

## **Last year's predictions were the following:**

### **You'll beam up your friends in 3-D**

In the next five years, 3-D interfaces – like those in the movies – will let you interact with 3-D holograms of your friends in real time. Movies and TVs are already moving to 3-D, and as 3-D and holographic cameras get more sophisticated and miniaturized to fit into cell phones, you will be able to interact with photos, browse the Web and chat with your friends in entirely new ways.

Scientists are working to improve video chat to become holography chat - or "3-D telepresence." The technique uses light beams scattered from objects and reconstructs a picture of that object, a similar technique to the one human eyes use to visualize our surroundings.

You'll be able to see more than your friends in 3-D too. Just as a flat map of the earth has distortion at the poles that makes flight patterns look indirect, there is also distortion of data – which is becoming greater as digital information becomes “smarter” – like your digital photo album. Photos are now geo-tagged, the Web is capable of synching information across devices and computer interfaces are becoming more natural.

Scientists at IBM Research are working on new ways to visualize 3-D data, working on technology that would allow engineers to step inside designs of everything from buildings to software programs, running simulations of how diseases spread across interactive 3-D globes, and visualizing trends happening around the world on Twitter – all in real time and with little to no distortion.

### **Batteries will breathe air to power our devices**

Ever wish you could make your laptop battery last all day without needing a charge? Or what about a cell phone that powers up by being carried in your pocket?

In the next five years, scientific advances in transistors and battery technology will allow your devices to last about 10 times longer than they do today. And better yet, in some cases, batteries may disappear altogether in smaller devices.

Instead of the heavy lithium-ion batteries used today, scientists are working on batteries that use the air we breath to react with energy-dense metal, eliminating a key inhibitor to longer lasting batteries. If successful, the result will be a lightweight, powerful and rechargeable battery capable of powering everything from electric cars to consumer devices.

But what if we could eliminate batteries altogether?

By rethinking the basic building block of electronic devices, the transistor, IBM is aiming to reduce the amount of energy per transistor to less than 0.5 volts. With energy demands this low, we might be able to lose the battery altogether in some devices like mobile phones or e-readers.

The result would be battery-free electronic devices that can be charged using a technique called energy scavenging. Some wrist watches use this today – they require no winding and charge based on the movement of your arm. The same concept could be used to charge mobile phones. for example – just shake and dial.

## **You won't need to be a scientist to save the planet**

While you may not be a physicist, you are a walking sensor. In five

years, sensors in your phone, your car, your wallet and even your tweets will collect data that will give scientists a real-time picture of your environment. You'll be able to contribute this data to fight global warming, save endangered species or track invasive plants or animals that threaten ecosystems around the world. In the next five years, a whole class of "citizen scientists" will emerge, using simple sensors that already exist to create massive data sets for research.

Simple observations such as when the first thaw occurs in your town, when the mosquitoes first appear, if there's no water running where a stream should be - all this is valuable data that scientists don't have in large sets today. Even your laptop can be used as a sensor to detect seismic activity. If properly employed and connected to a network of other computers, your laptop can help map out the aftermath of an earthquake quickly, speeding up the work of emergency responders and potentially saving lives.

IBM recently patented a technique that enables a system to accurately and precisely conduct post-event analysis of seismic events, such as earthquakes, as well as provide early warnings for tsunamis, which can follow earthquakes. The invention also provides the ability to rapidly measure and analyze the damage zone of an earthquake to help prioritize emergency response needed following an earthquake.

The company is also contributing mobile phone "apps" that allow typical citizens to contribute invaluable data to causes, like improving the quality of drinking water or reporting noise pollution. Already, an app called Creek Watch allows citizens to take a snapshot of a creek or stream, answer three simple questions about it and the data is automatically accessible by the local water authority.

## **Your commute will be personalized**

Imagine your commute with no jam-packed highways, no crowded subways, no construction delays and not having to worry about being late for work. In the next five years, advanced analytics technologies will provide personalized recommendations that get commuters where they need to go in the fastest time. Adaptive traffic systems will intuitively learn traveler patterns and behavior to provide more dynamic travel safety and route information to travelers than is available today.

IBM researchers are developing new models that will predict the outcomes of varying transportation routes to provide information that goes well beyond traditional traffic reports, after-the-fact devices that only indicate where you are already located in a traffic jam, and web-based applications that give estimated travel time in traffic.

Using new mathematical models and IBM's predictive analytics technologies, the researchers will analyze and combine multiple possible scenarios that can affect commuters to deliver the best routes for daily travel, including many factors, such as traffic accidents, commuter's location, current and planned road construction, most traveled days of the week, expected work start times, local events that may impact traffic, alternate options of transportation such as rail or ferries, parking availability and weather.

For example, by combining predictive analytics with real-time information about current travel congestion from sensors and other data, the system could recommend better ways to get to a destination, such as how to get to a nearby mass transit hub, whether the train is predicted to be on time, and whether parking is predicted to be available at the train station. New systems can learn from regular travel patterns where you are likely to go and then integrate all available data and prediction models to pinpoint the best route.

## **Computers will help energize your city**



Innovations in computers and data centers are enabling the excessive heat and energy that they give off to do things like heat buildings in the winter and power air conditioning in the summer. Can you imagine if the energy poured into the world's data centers could in turn be recycled for a city's use?

With up to 50 percent of the energy consumed by a modern data center goes toward air cooling. Most of the heat is then wasted because it is just dumped into the atmosphere. New technologies, such as novel on-chip water-cooling systems developed by [IBM](#), the thermal energy from a cluster of computer processors can be efficiently recycled to provide hot water for an office or houses.

A pilot project in Switzerland involving a computer system fitted with the technology is expected to save up to 30 tons of carbon dioxide emissions per year, the equivalent of an 85 percent carbon footprint reduction. A novel network of microfluidic capillaries inside a heat sink is attached to the surface of each chip in the computer cluster, which allows water to be piped to within microns of the semiconductor material itself. By having water flow so close to each chip, heat can be removed more efficiently. Water heated to 60 °C is then passed through a heat exchanger to provide heat that is delivered elsewhere.

Provided by IBM

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