

DANIEL BURRUS'

# TECHNO TRENDS

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THE BIG IDEAS THAT ARE  
CHANGING EVERYTHING

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## Stop Being Afraid of the AI Future

By Daniel Burrus, CEO of Burrus Research

AI systems are everywhere—on the Internet, in your pocket, in video games, but never have so many important people been so worried about them.

“The development of full artificial intelligence could spell the end of the human race.” That wasn’t some anti-technology Luddite. That was Stephen Hawking—one of the greatest physicists in history—speaking to the BBC.

Now listen to what Elon Musk, founder of Tesla and SpaceX, said. He called artificial intelligence “our biggest existential threat” when he was speaking at MIT. He was quoted in the Guardian as saying, “With artificial intelligence we are summoning the demon. In all those stories where there’s the guy with the pentagram and the holy water, it’s like – yeah, he’s sure he can control the demon. Doesn’t work out.”

By the way, Elon Musk is still investing in AI despite his worries. Bill Gates also recently warned about the dangers of AI. When doing a Reddit AMA (Ask Me Anything), he said, “I am in the camp that is concerned about super intelligence,” Gates wrote. “First, the machines will do a lot of jobs for us and not be super intelligent. That should be positive if we manage it well. A few decades after that, though, the intelligence is strong enough to be a concern.”

These guys have changed the world. They’ve been very right about some very important trends in science and technology—PC, space travel, physics—but could they be right about the dangers of AI? Will computers take over, killing us off or enslaving us? Will we someday

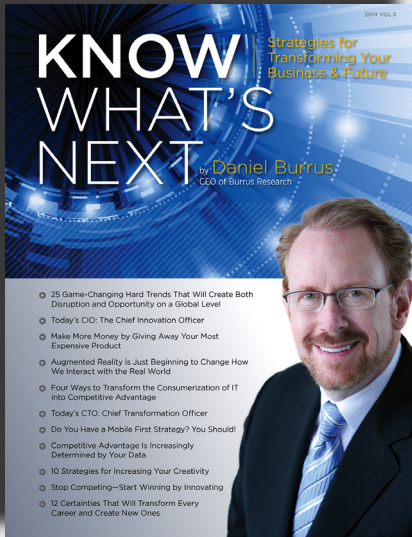
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## TECHNOLOGY NEWS HIGHLIGHTS

### Wearable Medical Sensors

As healthcare paradigms continue to move away from treating disease and toward promoting healthier lifestyles, consumers are becoming more engaged in monitoring and managing their own health. As a result, the market for wearable devices that measure everything from activity levels to vital signs has exploded in recent years, with no sign of slowing down any time soon. But the next generation of wearable devices is already in the works, and will be able to provide a more in-depth assessment of overall health than anything available today.

Wearable sensors that resemble colorful tattoos may someday be able to replace many of the laboratory tests that clinicians currently rely on to diagnose chronic diseases and monitor the effectiveness of treatment. For example, one patch-type device is capable of measuring glucose levels in the interstitial fluid just below the skin to provide a reliable indicator of blood glucose levels. Others measure potassium or lactic acid levels in sweat or saliva, and still others monitor pH levels or metabolic function. The obvious benefit is continuous feedback to the user which can be helpful in establishing healthier behaviors. However, all of these devices rely on electrochemical detection and wireless transmission of results, which requires a power source.

Bulky batteries generally offer limited run time or need daily recharging. One solution is a biofuel cell that generates electricity from sweat – enough to power an LED or wristwatch. Another approach that's being evaluated is to harvest energy (such as solar) from the environment.

Although it's been reported that not even half of users who currently own a wearable device use it every day, breakthroughs in technology and ease-of-use will likely fuel the growth of the wearables market well into the future.

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## Insect Inspired Machines

Some of the latest developments in factory automation are taking inspiration from the insect world. Based on the concept of using intelligent components that adjust to the needs of the collective, digital ants and bionic butterflies are working together to complete tasks that would otherwise be impossible.



The BionicANT (Autonomous Networking Technology) is one such example. Modelled on ant anatomy as well as their cooperative behavior, these tiny robots communicate and coordinate their actions to perform a variety of networked manufacturing functions. Even the process used to create them is unique, utilizing 3D printing and interconnected device technology to integrate design with function. A total of eighteen piezoelectric actuators that can be activated quickly and precisely using very little power are built right in to the tiny robots as they are fabricated.

Another insect-inspired machine, known as eMotion Butterfly, is designed to improve industrial logistics by flying throughout an indoor environment. Ten cameras positioned strategically throughout the space record the position of each butterfly and transmit the data to a central computer which controls them remotely.

Finally, the FlexShapeGripper has a form-fitting, water-filled silicone "tongue" that can grab odd-shaped objects and small parts for fragile assembly operations. All of the new technologies will be displayed and demonstrated at the global industrial technology fair, Hanover Messe, later this month.

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## Integrated Social Media for Business

IBM recently introduced a new social messaging platform that integrates email, file sharing, instant messaging, social



media, calendar functions and more in a single cloud-based, collaborative environment. Called IBM Verse, it takes advantage of the company's expertise in collaboration, analytics and security to create a social networking environment that is more responsive to the needs of business users.

For example, Verse can learn which emails are most important to a particular user and automatically prioritize them. It can also perform a "faceted" search across all types of content within an email account to pinpoint and retrieve specific information quickly. Social file sharing enables full life-cycle management of files and documents so that all users have access to the latest version as opposed to the version that was originally attached to an email. Files can be synchronized to desktops as well as mobile devices in a secure and encrypted environment.

Currently delivered on their SoftLayer Cloud, IBM also plans to offer a licensed version that may be deployed in on-premises, cloud or hybrid environments. There are also plans to offer native mobile apps for both iOS and Android devices which will integrate Verse with the MobileFirst Platform. A free version, called Verse Basic, is available at [www.ibm.com/verse](http://www.ibm.com/verse).

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## Smart Bandage



It is estimated that pressure ulcers (bed sores) affect 2.5 million people annually in the United States alone, adding an \$11 billion burden to an already strained healthcare system. Because they're associated with dangerous and deadly septic infections, they put hospital patients at nearly three times the risk of death, and the incidence of bed sores is on the rise due to the growing prevalence of obesity and diabetes.

But recent advances in flexible electronics have led to the development of a "smart bandage" that can detect tissue damage in its early stages, while it may still be reversible. The technology is based on the fact that electrical changes occur in cells when they die off. Dozens of electrodes are printed in an array on a thin, flexible substrate and a small current is applied between electrodes. Using a technique known as impedance spectroscopy, a map of the underlying tissue is created based on the flow of current at different frequencies. When a cell is healthy, the cell membrane acts like an insulator and the impedance is high. But, as the cell walls begin to break down, they allow current to flow more readily.

The device was tested on rats where pressure wounds were mimicked by squeezing the bare skin between magnets for one to three hours. When the magnets were removed, the accelerated cell death caused by oxidative damage and inflammation was measured using the bandage. Quantifiable changes in the electrical resistance were evident, with milder injury (one hour of pressure) showing signs of reversal after several days, and more severe injury (three hours of pressure) producing more serious, permanent damage.

The technology could be incorporated into wound dressings or designed as a spot-check device for clinicians to monitor targeted areas of the body.

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## Persuasive Technology

The idea of building a business model around influencing human behavior is not new. For decades, enterprises like casinos and cigarette manufacturers



have thrived on the concept of habit formation. Similarly, technology has changed the way people behave to introduce a whole new way of communicating and interacting with our environment, and exploits those behaviors to generate continuous streams of new devices and services.



Now technology developers are taking things one step further to design products that are specifically aimed at shaping people's habits. Combining psychological and behavioral insights into how and why individuals make specific choices with knowledge of how the brain works, companies are actually training users to act in a certain way.

For example, one mobile game designer collects data from its users – such as the time of day that they tend to play, which games they prefer and how they react to losing – and uses that information to induce players to play longer. By watching for changes in the time between finger presses and the intensity of play, they can predict when someone is losing interest with a high degree of accuracy, and suggest other games to keep players online.

Other platforms that employ persuasive technology are aimed at improving employee participation in corporate wellness programs, enhancing product marketing with advertising that's targeted to individual consumers, and even influencing voters on political issues.

Regulations currently require companies to obtain user permission before tracking their behaviors, but these new technologies will likely generate some new discussion about transparency and disclosure when it comes to persuading consumers to form new habits.

*For information: Habit Design, Inc.; Web site: [www.habit-design.org](http://www.habit-design.org)*

*GSN Games; Web site: <http://gsngames.com/>*

*Rocket Fuel; <http://rocketfuel.com/>*

*Zaius; [www.zaius.com/](http://www.zaius.com/)*

## New Life for Packing Peanuts



Packing peanuts revolutionized the shipping industry by offering the perfect solution for transporting just about anything. Unfortunately, only about ten percent of them get recycled, leaving the rest to take up lots of space in already packed landfills. But recently, researchers found a new use for the Styrofoam morsels – to create high-performance anodes for rechargeable lithium-ion batteries.

The process is straightforward, inexpensive, and environmentally benign and has the potential for large-scale manufacturing. Basically, the peanuts are heated to a high temperature in a furnace under an inert atmosphere. Depending on whether they are made of starch-based materials or polystyrene, a transition metal salt catalyst may also be added. The result is a thin, porous microsheet which may be turned into anodes that outperform traditional graphite electrodes.

Because they are about ten times thinner, the peanut-derived anodes have a lower electrical resistance, which means faster charge/discharge times. Long term stability is also improved with no significant loss of capacity even after 300 charge/discharge cycles.

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## Smart Headlights

German engineers are working on ways to make driving safer by optimizing headlight illumination based on the driver's line of sight. The eye-tracking system uses a simple webcam to detect subtle movements of the nose and eyes, and utilizes complex algorithms to convert the data into commands that adjust the position of the headlights. Peripheral infrared sensors enable the system to scan the driver's eyes even at night.



Electronically controlled actuators instantaneously move the headlights horizontally or vertically depending on where the driver is focused. However, a sophisticated delay algorithm is employed to compensate for natural and unconscious reflexes in which a driver's eyes move from one focal point to another.

The system also includes an LED-matrix lighting system that will be programmed to adjust lighting levels based on a wide range of road conditions including adverse weather, pedestrian areas, city, country or highway driving. In addition, the system deactivates individual LEDs within the matrix when light from an oncoming vehicle is detected. This prevents "blinding" an approaching driver while still illuminating the rest of the road.

The new adaptive lighting system is scheduled for introduction within 18 months.

## Fuel from Ag Waste

Converting cellulose-rich agricultural waste into fuel is a challenge that has eluded researchers for years. In order to produce biofuel, the waste needs to be fermented – and that requires yeast. But before that can even occur, it needs to be turned into a substance that can be fermented. That process requires heat and acidic conditions, and produces compounds known as furfurals, which are toxic to yeasts. Certain genetically modified yeasts have been developed that are tolerant to furfurals, but U.K. researchers have now identified some naturally-occurring strains that can withstand these compounds.



The best of the bunch turns out to be related to the yeast that's used to ferment rice into Sake. Called *S. cerevisiae* NCYC3451, it produced the highest ethanol yield of the five strains studied.

New processes such as these would relieve pressure on farmers by providing a useful and economical means to dispose of agricultural waste. More importantly, however, the ability to generate fuel from straw, corncobs, and sawdust would alleviate the need to choose between using land used for "food crops" and using land for "fuel crops."

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# Stop Being Afraid of the AI Future

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have to ban AI systems for the good of humanity? Could investing in AI mean investing in the end of life as we know it?

It's not only the tech world that's worried about artificial intelligence. Just look at your Netflix queue. From *The Matrix*, to the Terminator movies, *2001: A Space Odyssey* to *Transcendence*, science fiction is rife with evil artificial intelligence that enslaves or destroys humanity.

## Which Movie are you Watching?

If we're going to be successful in predicting the future, we're going to have to make our predictions based on science, not science fiction. This is why I talk so often about the difference between Hard Trends and Soft Trends. Hard Trends are predictions about things that we know are going to happen. Soft Trends, on the other hand, are based on what we think might happen.

Likewise, it's important to remember the difference between Hard and Soft Assumptions. A Hard Assumption is when we have "good data" that supports the assumption; it's based on real, solid data. A Soft Assumption is not based on research or data, but instead is based on gut-level instinct.

When you look carefully at the predictions about Artificial Intelligence from Stephen Hawking, Elon Musk, and Bill Gates, you realize that they're not basing their predictions on actual data. They're afraid of AI getting out of control and taking over the world. But there's no trend of AI systems ever killing people or enslaving them. These men may be geniuses, but they're making Soft Assumptions about the future, without any real basis in fact.

Here's the main point I want to make: the only way that AI systems can hurt us is if we let them. People will always have strong overrides to control their machines. We should use Hard Trends to see where AI is going and make Hard Assumptions based on real evidence. We need to make predictions based on what's really happening rather than some nightmare we've imagined.

## Exponential Changes

So what kind of Hard Assumptions can we make about Artificial Intelligence? We have several laws in computing that we can look at to see where AI development will go.

First is the Law of Processing Power. According to Moore's Law, processing power doubles every 18 months. Think about the last computer you bought. It was most likely smaller than the one you bought before that, and faster too. The smartphone you bought last year was probably faster than the computer you bought ten years ago.

Similar to this is the Law of Digital Storage, which says that digital storage capacity doubles every 18 months as well. Likewise, the Law of Bandwidth states that bandwidth will increase and get cheaper in the same time frame.

These laws describe Exponential Changes, changes that accelerate at faster and faster rates, rather than just increasing at the same rate. All of this means that AI isn't just improving, it's improving faster every day.

## AI is in Your Pocket

And where AI is going is already amazing. Many of you are carrying AI systems in your pockets, like Siri and Google Now. They use the processing power in modern smartphones to analyze natural language, and mobile connectivity to tap into vast amounts of storage.

Remember Watson, the IBM supercomputer that won on “Jeopardy”? Watson has been very busy since then. Watson learned to cook by plowing through Bon Appetit magazine’s nearly 9,000 recipes. Google’s been famously working on integrating AI systems with cars, to develop safer, more efficient self-driving vehicles.

OK, what can AI do for us beside playing games or looking up recipes? Here’s another Hard Trend: thanks to improvements in radio-frequency identification technology (RFID), and the spread of wireless internet, we are on the brink of an AI revolution. I’m talking about the rise of the Internet of Things. Right now, you have a smartphone, and you might have a “smart” thermostat. But soon you’re going to have a whole integrated smart home, where all the devices can communicate with one another and transmit data back and forth. Your home will be an AI system. And with all that data flying back and forth, we’ll need even more technology to make sense of it.

### Life-Saving Robots

Once you realize that fears about AI taking over the world are in the same league as monsters under the bed, the possibilities for AI are endless.

Instead of Siri just telling you the weather, she might help you choose which stocks to buy—or what to stock in your store. If Watson was working in your restaurant, it could track the ingredients in your fridge and then suggest new dishes. The point is, combined with the Internet of Things, AI will allow business owners and managers make smarter, faster, less risky predictions.

Here’s another trend to think about: traffic accidents

are one of the most common causes of death in the US. Self-driving cars with AI could save thousands of lives every year. So much for the Terminator. But there’s a business benefit, too. Self-driving cars will use fuel much more efficiently and find better routes. If you’re involved in any kind of transport industry, that turns into huge savings. You’ll still need your human drivers, but you’ll keep them and your cargo safer—and delivering it more efficiently—with the help of AI.

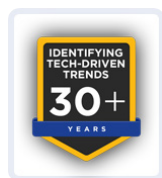
### That Human Touch

The real reason not to fear AI is that, with all its advances, there are some things it will never be able to do. Our self-driving pizza delivery service will still need a person to bring the pizza to your door—and smile. Restaurants will still need chefs to build menus. Your business will still need you to make the right decisions to keep it growing.

AI can help optimise business processes, but at the end of the day, it’s human beings who have to decide whether to accept or reject the computer’s insights.

The real Hard Trend is that no matter how smart AI becomes, there will always be a person behind it. Who do you want that person to be? You, or someone else?

Because if you can’t imagine the ways AI can help your industry, then your competitors definitely will. You can bet they’re thinking about the future while you’re still watching The Matrix. That’s why you must look at where AI technology is going and harness it, rather than letting your fears stop you.



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