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Daniel Burrus'

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# TECHNOTRENDS<sup>®</sup>

## NEWSLETTER

*The biggest ideas that are  
changing everything*

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# Tesla Is Redefining the Customer Experience

*By Daniel Burrus, CEO of Burrus Research*

One of the harsh realities of this fast-paced digital world is that almost everything we buy is out of date by the time we get it home. To obtain the most value of any purchase, especially if it is an expensive one, we need to adopt a future mind-set to help us avoid picking up legacy products.

Driving has long been considered a symbol of personal freedom — an open road going forward, with almost limitless possibilities and opportunities on the horizon. For this reason alone, car manufacturers like to add new features that make us feel like we are purchasing a car that is equipped to transport us into the future.

I recently found myself wanting to replace my hybrid SUV. I have been very happy with my Lexus, but before buying, I wanted to see what the other major brands — including BMW, Mercedes, Porsche and Cadillac, to name a few — had to offer, to see which was most suited to me and my lifestyle. As you might guess, since I have been forecasting semi-autonomous as well as fully autonomous car features for decades now, I was interested to see what they had to offer at this point in time.

As you would expect, all of the high-end vehicles had great features, including automatic braking and various systems to alert you if you are about to change lanes and hit another car that is in your blind spot. However, it was when I drove the new Tesla Model X that I felt like I was driving

in the future. After that test drive, my view of the other brands was changed. All the others instantly felt like the past.

From a customer experience perspective, that's a powerful shift. Any time you can make the competition seem like they are offering yesterday's features and functions, and you are offering tomorrow's, you can accelerate growth well into the future.

“ *Buying a car has always been a left-brain and a right-brain experience.* ”

Buying a car has always been both a left-brain and a right-brain experience. On one hand, we would love to buy that just-out-of-reach dream car, the one that our emotional, creative side would love to have. On the other hand, our rational, logical, sensible mind wants the car to be safe, economical and not too expensive. Tesla has found a way to do both.

To satisfy the emotional side, Tesla has an amazing feature list. For example, there is a summon feature on the Tesla key fob that allows you to command the car to unpark itself and meet you at the curb. This is very cool, but it is more than a gimmick. Summon provides the

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## TECHNOLOGY NEWS HIGHLIGHTS

# Virtual Power Plant

Although the solar industry has made great strides when it comes to generating clean, sustainable power, significant reductions in our reliance on fossil fuels will necessitate a total rethinking of our current distribution systems.

First of all, the intermittent nature of renewable power sources (including solar, wind, wave and others) means that reliable and efficient methods of storing electricity are needed to meet power demands during "off-peak" periods. Secondly, it will be necessary to move away from large, centralized power plants to smaller networks of localized generators in order to minimize power losses associated with long distance transmission.

New York utility Consolidated Edison is currently working with a solar power developer and an energy storage company to test these ideas. The pilot program links together 300 solar-enabled homes as

a virtual power plant to function as a single unified resource. Homeowners lease the solar panels from the utility and pay a fee to have backup batteries installed. The system has a combined generating capacity of 1.8 megawatts and storage capacity of four megawatt-hours, which will power 300 average sized homes for about 10 hours.

The goal of this initiative is to improve the reliability and resiliency of the power grid while reducing the number of fossil-fuel plants currently in use. Although the numbers are small, the project will lay the groundwork for much larger systems in the future, particularly as prices for batteries and other storage technologies continue to drop.

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# Graphene e-Paper

A new type of electronic paper has been developed that is more pliable than other e-papers, while offering better intensity, contrast and transmittance.

The new graphene based material is also highly energy efficient and thinner than liquid crystal displays, making it ideal for use in a wide range of portable devices such as e-book readers, watches and smartphones, as well as digital signs, billboards and electronic shelf labels.

Unlike currently available e-papers which use rare and expensive component metals like indium, graphene e-paper is derived from carbon, making it much more cost effective to produce.

At the atomic scale, graphene is a two-dimensional, honey-comb lattice only 0.335 nanometers thick. It's an excellent conductor of electricity and heat, but is also the world's strongest and lightest material.

All of this adds up to a breakthrough material that could finally catapult e-paper into mainstream use.

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# Language Learning Game

Cornell University researchers are combining computer-based learning with interactive gaming technologies to create a new kind of language learning experience. Called "Crystallize", the game is designed to not only increase learning but also enjoyment.

In the prototype version (which is designed to teach the learner Japanese), the goal is to secure a job by learning to communicate and make friends. In a series of quests, the player learns new words by observing game characters as they speak to each other. As tasks are completed, the player moves to higher levels while earning virtual money and boosting their confidence score. The game can also be played in teams, where partners communicate with each other via chat. Based on test scores before and after, players learned more words when they were engaged in such a collaborative environment.

The developers are working on a virtual reality version of the game which will be aimed at increasing understanding of not just how things are said, but when and why they are appropriate.

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# The Nose Knows

A variety of chronic diseases could soon be detected much earlier, while reducing the need for expensive and invasive testing, using a prototype “electronic nose.” The device utilizes CMOS integrated circuits to detect very low levels of chemicals in a person’s breath with an accuracy level that rivals blood tests.

Exhaled air contains information about many systems in the human body – from the blood as it circulates around the lungs to digestive gases in the stomach. The chemical makeup of these gases can be quantified with a technique known as rotational spectroscopy.

Samples are exposed to electromagnetic waves over a wide range of frequencies which are selectively absorbed by specific compounds.

By analyzing how the waves are attenuated the system can identify what chemicals are present and in what concentration. In some cases, the electronic nose has demonstrated greater specificity and sensitivity than breathalyzers, which have a hard time distinguishing acetone from ethanol, for example. This presents a problem for diabetics who typically exhibit high levels of acetone in their breath.

While breath analysis is not a new concept, the systems traditionally used are bulky and expensive. The use of CMOS technology will make the electronic nose much more affordable, and therefore, more widely available. The device will first be released for use in industrial applications, hospitals and clinics, however, it will very likely become available to consumers as the technology matures.

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# Miniature Camera Lens

Researchers have developed a camera lens that’s so small it can fit over the end of a fiber optic filament – a breakthrough that could have profound implications for medicine as well as other applications. The lens is so small that it can be injected into virtually any part of the human body using a standard hypodermic syringe, giving physicians the ability to perform exploratory procedures without the need for surgery or endoscopy.

Best of all, the lenses can be produced in high quantities, to exacting specifications, quickly and inexpensively on a 3D printer. The new

printer uses a technique which focuses lasers onto a liquid polymer to harden the material layer by layer. The small size is made possible by delivering ultra-short pulses (two photons at a time).

In addition to the wide-ranging medical uses, the small lenses (about the size of a period at the end of a sentence) are ideally suited for covert surveillance. The flexibility of the printing method will also open doors for miniaturized optical instrumentation, illumination systems, quantum emitters and detectors and tiny, insect-like drones with autonomous vision capabilities.

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## 3D Hair

Yet another breakthrough in 3D printing will enable extremely fine features – including hair, fur and brushes – to be designed and printed quickly and efficiently. In the past, modelling and printing thousands of hair-like structures consumed large amounts of computational time and power. But a new software platform called “Cillia” enables users to program such structures in a matter of minutes.

The developers designed arrays of structures about the width of a human hair (50 microns). They then printed the arrays onto flat and curved surfaces, varying the dimensions to mimic a variety of thicknesses and densities from coarse bristles to fine fur. But printing wigs and hair extensions is not their goal.

Research has shown that the 3D printed hair can perform a range of useful functions including adhesion, sensing and actuation. For example, by changing the printing angle, arrays of Velcro®-like bristles can be made to adhere to each other with varying levels of force.

A fur-like structure can sense when a person is stroking it and light up in response to the stimulus. And vibrating panels of printed hair were demonstrated to be capable of moving coins across a table.

Another great example of how technology, inspired by nature, can yield amazing results.

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## From Smartphone to Satellite Phone

The only way to guarantee cellphone service anywhere in the world is to own a satellite phone.

Well, now you can keep your iPhone or Android and have satellite access too...without another dedicated phone.

SatSleeve is a smartphone satellite adaptor that allows users to stay connected even in remote locations. Originally marketed for maritime applications, the unique device guarantees coverage in any location – inside or outside of terrestrial networks.

In addition to calls and SMS messaging, it also supports emails, instant messaging and browsing, and includes a rechargeable battery with an optional solar charger.

Although the device itself costs about \$500, calls and data rates can cost up to several dollars per minute. If you need to be connected no matter where you are in the world, a satellite phone is the way to go.

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Even with the current trend toward renewables and energy efficiency, carbon capture and sequestration

(CCS) remains an essential component of a globally sustainable energy future, as increasing CO<sub>2</sub> levels in the atmosphere contribute to growing concerns regarding climate change and ocean acidification. CCS refers to the process of removing carbon dioxide (the by-product of fossil-fuel power plants) from smokestacks and pumping it into rock formations deep underground.

One of the main problems with this approach is that storage sites require monitoring (for decades or even longer) to ensure that gasses don't escape back into the atmosphere. But scientists recently came up with a way to store CO<sub>2</sub> while drastically reducing the need for long-term monitoring. The key was finding the right rock.

Volcanic rocks – also known as basalts – contain large concentrations of calcium, magnesium and iron, all of which react readily with carbon dioxide to form a solid mineral called calcite. The process essentially turns the gas into stone, locking it away permanently. It was tested at a geothermal utility plant in Iceland where researchers pumped 250 tons of CO<sub>2</sub> mixed with water into porous basalt about 1,500 feet below the surface.

The gas was laced with a radioactive isotope so that it could be traced as it spread through the rock. In less than two years, they found that approximately 95 percent of the CO<sub>2</sub> had been converted into calcite.

The researchers believe that this process could be used to store billions of tons of carbon dioxide each year enabling significant reductions in global CO<sub>2</sub> emissions, at least until alternative technologies can replace fossil fuels as our primary sources of energy.

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# Redefining the Customer Experience

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driver with a direct line of sight to potential danger zones around the car. Ultrasonic sensors placed around the vehicle proactively guard against any unseen or moving hazards and enable the car to stop as soon as anything is detected. If the driver decides to stop the car at any time, he or she can do so with a simple tap of the key fob, app or any door handle. Even if you find summon gimmicky, it sure does amp up the cool factor.

Having an SUV that is as fast as a Lamborghini but without burning any gas, and a national network of recharging stations that provides free electricity, easily satisfies both sides of the brain. This, combined with its 250-mile-plus range and the ability to get a 75 percent recharge in 30 minutes for free by using one of the many national recharging stations, adds a layer of practicality to all the fun.

I must admit, it's the autopilot mode that steals the show. Armed with a dashboard showing all the cars around you in real time, along with the ability to take your hands off the wheel — but not your eyes from the road, in my opinion — and let the car drive itself makes other car brand test drives seem like you're driving the past.

And let's not forget your ability to end the days of dreading parallel parking in those very tight spots. This has also been relegated to the past. The car can do it all for you.

Now for the logical, rational, accountant side of your brain. It's true that the Tesla Model X starts at \$85,000, making it a very high-end vehicle. However, when you consider that there is a \$7,500 federal tax credit, a state tax credit (not all states have them yet, but California gives you a \$4,500 deduction) and, finally, if you own a business, there is another federal tax credit, that is up to \$25,000 off the price for the Tesla SUV. Using the California resident example, the \$85,000 Model X would cost you \$48,000. When adding up all of these incentives, Tesla suddenly becomes much cheaper than buying a luxurious, gas-powered SUV. And now take away all of the gas you won't have to purchase. And take away all the service you won't need, since there are no fluids to change and no transmission or engine that needs maintenance. Now things are starting to sound good to your entire brain.

The realization that the Tesla is already offering a wealth of future-oriented features — features that can save lives, features you know we will all have someday — has the power to change how potential customers think.

Tesla, like Amazon, is what I call an Anticipatory Organization™, one that identifies the Hard Trends that will happen and then uses that knowledge to turn disruption and change into its biggest advantage.

With all of this in mind, where would the greatest young engineering talent want to work? Ford, General Motors or Tesla? I suspect that Tesla would attract the talent because it is showcasing the future, today.

I'm sure you have read about the amazing number of pre-orders, over 400,000, that have been made for Tesla's lower-priced SUV, due to be released in a few years. What we are witnessing is a seminal moment that is similar to

when BlackBerry phones suddenly felt like the past and the iPhone became the future. Tesla is becoming the iPhone of automobiles.

Elon Musk and his Tesla venture have illustrated the importance of having an anticipatory mind-set. This does not mean that the other manufacturers cannot catch up or tread a similar path. But it offers a clear warning to businesses in all industries of what will happen if they do not shift from reacting and responding to change, to anticipating it.

Rather than sitting around waiting to be disrupted, maybe it's time to jump on board and disrupt both yourself and your industry, to become the disrupter. We often talk about legacy software and hardware holding businesses back, but the reality is that legacy thinking is far more damaging.

If your company wants to attract the most talented employees as well as the imaginations of future customers, you need to follow Hard Trends and learn to become anticipatory rather than getting better at reacting.

When I returned to the showroom a few weeks ago, it quickly became apparent that Tesla is a prime example of an Anticipatory Organization. The majority of competitors within the automotive industry are still taking incremental steps rather than exponential leaps. The majority have embraced the idea of agility as the best way to turn rapid change into an advantage. The problem they are finding is that all organizations are becoming agile organizations, which greatly decreases the advantage of agility and, more importantly, the main advantage of agility is that you can be far better than your slower competitors. Being agile is very important and we all should get better at it, but it is no longer enough.

It's true that there is more uncertainty today than ever before. On the flipside of this coin is the science of certainty, learning to separate the Hard Trends that will happen from the Soft Trends that might happen. As the exponential pace of technological change continues, having the ability to foresee growing problems, disruptions, customer demands and new opportunities has never been more important.

When Elon Musk predicted Tesla Motors would go where no car company has ever gone before, many deemed him deluded. But then those people carried on with the way things have always been done, so who is the crazy one here?

Technology now surrounds us. The rapid rise of the internet of things (IoT) in our cities, businesses, infrastructure and even our homes will also raise the bar of both our expectations and demands. As our world continues to evolve, why would the automotive industry remain the same? Why would a dealership stay the same as it always has been? Why would I want to buy a new car that has only a few more new features than the car I'm driving now?

I see Tesla as a wake-up call to all of the other brands. I would expect we'll see rapid innovation on the part of all the other major brands. This is not a future fact, thus it's a Soft Trend. But I think it is highly likely nonetheless, and we as consumers will all benefit in the end.

Having a business strategy based on certainty has low risk. Tesla is simply enjoying success by having the ability to anticipate the future. Leaders now have a choice to anticipate today, before their competitors do, or find themselves left behind in the slow lane. What are you going to do?

An abstract graphic consisting of a dense network of thin, light-gray lines connecting small, dark-gray circular nodes. The nodes and lines are concentrated on the right side of the image, creating a complex, web-like structure that resembles a molecular model or a data network. The background is a solid dark gray.

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