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Daniel Burrus'

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The biggest ideas that are changing everything

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Daniel Burrus' Top 20 Technology-Driven Hard Trends Shaping The Future

By Daniel Burrus, CEO of Burrus Research

There has never been a shortage of trends, and it's predictable that, as we near the end of every year, a new batch of trends will be published. The real problem for you is figuring out which ones will happen. I have been publishing a list of top trends since 1983, and if you have been a subscriber to my newsletter for decades, you know they have been highly accurate. The reason for this is the methodology that I developed back then, which separates what I call Hard Trends, the trends that will happen, from Soft Trends, the trends that might happen. Knowing their distinctions can make all the difference; and this year's Top 20 List is no exception.

> ***These trends for 2017 highlight enormous game-changing opportunities.***

I have been writing about each one for many years, but to make it on my annual list, they have to be developed enough for you to apply them to exponentially grow your business. Each is growing at an increasingly exponential rate. As such, they will all impact our lives, both personally and professionally, in the coming year and beyond.

These trends highlight enormous, game-changing opportunities in a broad array of applications and industries. I hope the New Year affords you the opportunity to leverage the remarkable promises they all offer.

1. Artificial Intelligence (AI), Advanced Machine Learning and Cognitive Computing Applications
Cognitive Computing Applications Grow Rapidly. Advances in Machine Learning and AI, such as IBM's Watson, coupled with networked intelligent sensors, will create a giant leap forward thanks to exponential advances in computing power, digital storage, and bandwidth. AI will increasingly become embedded in our applications and processes. Also, thanks to better sensors, increasing Machine Intelligence, and Siri-like voice communications, robots will work with humans in new and productive ways. Advanced Automation and Robotics will likewise benefit.

2. Adaptive and Predictive Cybersecurity Systems
Business, government and education have moved cybersecurity from an underfunded back office activity to a major initiative going forward. With the rapid growth of connected technologies such as the Internet of Things and semi-autonomous, as well as fully autonomous, cars, security systems will move beyond reacting faster to include adaptive security systems using AI and other advanced tools such as Behavioral Analytics. This will add a level of Predict and Prevent, allowing us to stop many, but sadly not all, attacks before they start.

3. Big Data and the use of High Speed Data Analytics
Big Data is a term that describes the technologies and techniques used to capture and utilize exponentially increasing streams of data. The goal

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TECHNOLOGY NEWS HIGHLIGHTS

Solar Drinking Water

As we reported in last month's issue of Technotrends Newsletter, the lack of clean drinking water is a growing global threat. And the problem isn't limited to only the poorest countries, nor is it constrained to arid regions of the world.

The fact is, even in the United States, more than 5,300 municipal water systems face concerns with unhealthy drinking water due to lead pipe infrastructures and other pollutants.

As a result, more and more forward-thinking companies are springing up to address this fundamental human right through the creative use of technology.

For example, a new solar panel, called Source, is designed to passively absorb water from the air and pipe it directly into the home. Although details about the system are still under wraps, the key component is a new material that draws in moisture – like an open bowl of sugar, only faster and more efficiently.

The solar panel then powers a process to drive the water back out and purify it through evaporation. The ultra-pure, double-distilled water is then put through a filter block containing calcium and magnesium to improve the taste and add beneficial minerals. One panel will provide adequate drinking and cooking water for a family of four.

Pilot programs have already begun in Ecuador, Jordan, Mexico and the U.S. In 2017, the company plans to scale up production for larger systems.

For information: Zero Mass, Inc., 6500 East McDowell Road, Scottsdale, AZ 85257; phone: 928-487-0969; Web site: http://www.zeromasswater.com/

Foldable Drone

A new drone was recently unveiled, which folds down to about the size of a water bottle, allowing for a broader range of consumer applications.

Known as Mavic Pro, its 4K camera is stabilized by a triple-axis mechanical gimbal.

Five vision sensors, two ultrasonic range finders and 24 high-performance computer cores enable it to fly autonomously, avoid obstacles and hover precisely without GPS.

Users can control the drone from their smartphones at a range of up to 4.3 miles (7 kilometers) with video streaming at 1080p short range and 720p long range. Total flight time is 27 minutes on a full charge.

The list price of Mavic Pro is $999 with a remote controller and $749 without.

For information: DJI, 14th floor, West Wing, Skyworth Semiconductor Design Building, No. 18 Gaoxin South, 4th Avenue, Nanshan District, Shenzhen, China, 518057; phone: +86-0755-2665-6677; Web site: http://www.dji.com/mavic

Automotive Biometrics

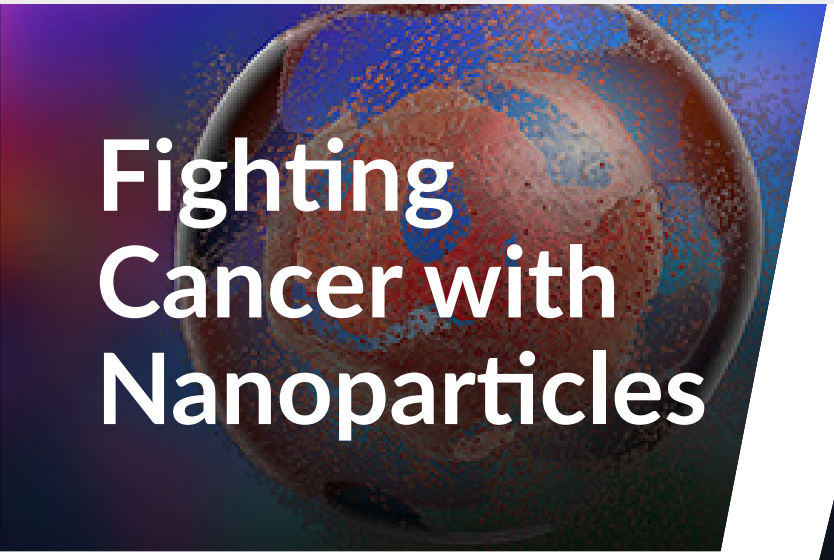
A recent report by Frost & Sullivan predicts that wearable technologies will radically transform the auto industry in three major areas: health wellness and wellbeing (HWW), security, and the driving experience.

The trend is being driven by advanced biometrics and human-machine interaction (HMI) capabilities as well as the need for advanced driver assistance systems (ADAS) to improve safety.

Innovations in this arena include systems to monitor head movements, eyelids and posture for signs of fatigue; brain wave and pulse monitors to detect the onset of medical events; fingerprint and iris recognition to improve security; and language or gesture recognition for enhanced navigational capabilities.

In addition to staying on top of these technological advancements, industry suppliers may need to revisit existing business models as new regulations governing performance, safety and cybersecurity of sensitive personal data continue to shape this dynamic market.

For information: Frost & Sullivan; Web site: https://store.frost.com/biometrics-in-the-global-automotive-industry-2016-2025.html



Fighting Cancer with Nanoparticles

Researchers recently announced a breakthrough in nanoparticle technology that could prove to be an effective weapon against cancer. While most of the next-generation therapies currently being investigated focus on harnessing the body's immune system, the new approach targets the cells that allow cancer to spread.

Within the body, immune cells build structures known as neutrophil extracellular traps (NETs). These structures normally function to fight bacteria, but are sometimes exploited by cancer cells to metastasize to other parts of the body. In the technique being investigated, nanoparticles are coated with an enzyme that kills the NETs before the cancer cells can attach to them. In a preliminary study on breast cancer in mice, three of nine mice that received the nanoparticles showed no signs of cancer progression, while the cancers in the entire control group continued to worsen.

Although the results are promising, important questions remain with regard to how effective such a technique would be in humans. Since NETs are designed to fight bacteria, limiting their ability to fight infection could prove detrimental to cancer patients whose immune systems are already compromised. Additional research will also be needed to determine whether the approach would be effective on other types of cancers.

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Body Movements Can Reveal Your Passwords

At a recent conference on computer and communication security in Vienna, Austria, a team of researchers from the United States and China demonstrated how analyzing the signal information from a WiFi hotspot can reveal private information. The paper, published by the Association of Computing Machinery, claims that a system has been developed that can detect passwords (commonly used by banks, payment apps, etc.) with nearly 82 percent accuracy.

The method – which has been dubbed WindTalker – requires a multiple-input, multiple-output (MIMO) antenna configuration in which small phase differences are monitored to reinforce signals in some directions while cancelling them out in other directions. By exploiting this feature, the researchers were able to observe and analyze very small changes in the multi-path signals as reflected by the channel state information (CSI) to identify unique interference patterns related to hand and finger motions. The most threatening aspect of the system is that it uses publicly

available WiFi to collect data and doesn't compromise the target device in any way, making it easy to deploy and difficult to detect.

Research such as this will be vital in improving mobile cybersecurity for the future. For example, banking and payment apps could be programmed with randomized keypad layouts so that, although hackers could still track the users' finger positions, they would not be able to tell what keys were actually pressed.

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Robot Valet

A leading manufacturer of video surveillance equipment recently launched a smart parking system, complete with a robot valet that can park a car in under two minutes. The system, which evolved from computerized warehouse logistics, could increase utilization of urban parking lots by up to 40 percent.

As drivers enter the smart car parks, monitors assist them in positioning their vehicles precisely on racks. The drivers exit the vehicles and collect parking vouchers using the car park touch screens or smartphone apps. At this point, the robots take over – first confirming that the cars are turned off and the parking brakes are on, then driving them automatically to the optimal locations as selected by the smart parking systems. When they return to collect their cars, the owners key in their voucher numbers and robots are dispatched to retrieve them.

The smart parking system costs about $30,000 and will initially be available in Beijing and Shanghai. The developers are confident that the increased utilization of prime parking real estate, along with lower operating costs and reduced risk of fender-benders will make it an attractive alternative for large city operators.

For information: Hikvision Digital Technology Co. Ltd., 555 Qianmo Road, Binjiang, District, Hangzhou 310052, China; phone: +86-571-8807-5998; fax: +86-571-8993-5635; Web site: http://www.hikvision.com/en/index.html

Broccoli That Tastes Like Chocolate?

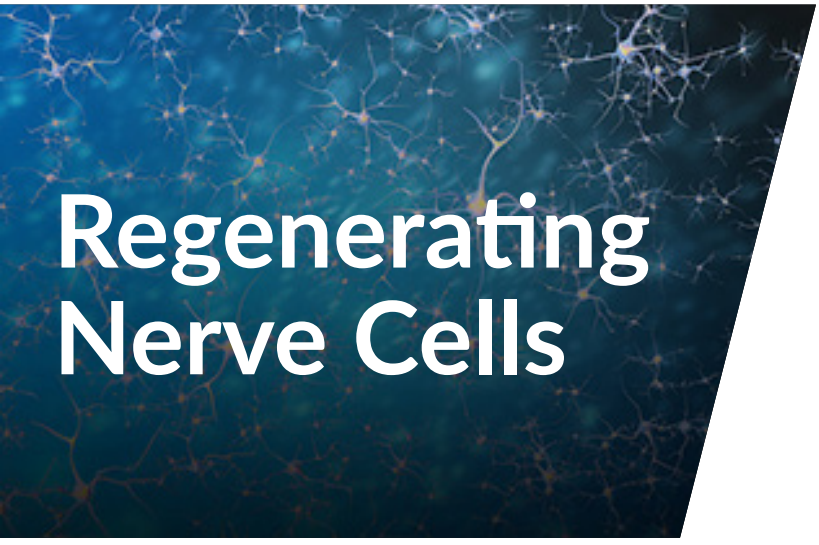
It started out as a fun engineering experiment, but UK researchers may have stumbled on something that could have a profound social impact – an electronic "spoon" that makes food taste sweeter.

Sour and salty taste receptors on the tongue work by detecting the reaction between

saliva and the acidity of hydrogen or sodium. However, the same reaction can be simulated by stimulating the tongue with thermal and electrical signals that "trick" it into tasting unappetizing or bland foods as treats. The intensity of the simulated taste may also be varied. For example, for many people, sweetness is proportional to the temperature of the food. So, to increase the sweet sensation, the device increases the temperature of the tongue from about 77 to 104 degrees Fahrenheit (25 to 40 degrees Celsius).

In its prototype form, the Taste Buddy consists of a 2 centimeter (less than one inch) wide tab that sits on the tongue, but the hope is to one day make it small enough to fit into cutlery, drink cans and cups. Although it's currently able to simulate only sweet and salty tastes, future versions could cover a wide range of flavors. The developers envision even being able to program the device via Bluetooth so that users can choose the levels that suit their senses of taste, thereby helping individuals eat healthier without missing out on the flavors they love.

For information: Adrian Cheok, University of London, Senate House, Malet Street, London WC1E 7HU, United Kingdom; phone: +44-020-7862-8000; Web site: http://www.london.ac.uk/



Regenerating Nerve Cells

It was once thought that nerve damage and spinal cord injuries were hopelessly irreversible, but research into how certain animals are capable of regeneration has led to new insights into tissue repair in humans.

One of the most remarkable examples is the zebrafish, which can fully reverse a severed spinal cord without intervention in as little as eight weeks.

First, bridge cells (called glia) extend projections across a wide span of the injury to distances tens of times their own length. The nerve cells follow once these bridges have been formed.

When scientists conducted a search for abrupt changes in gene activity immediately following injury, they found that one protein – called connective tissue growth factor (CTGF) – was found in high levels in the supporting glia cells, and when CTGF was genetically deleted, the fish indeed failed to regenerate.

This led them to investigate whether the human CTGF protein (which shares 90 percent of its genes with that of zebrafish) would have an effect on regeneration rate in the fish. The findings indicate that the human gene actually accelerated regeneration to the point where the fish were swimming better within two weeks.

The researchers are careful to point out that healing is a much more complex process in mammals partly due to scar tissue formation. However, they intend to continue experiments on mice to determine whether the protein can be controlled to improve its performance in humans.

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is to bring enterprise-wide visibility and insights that enable making rapid, critical decisions. Using advanced cloud services, High-Speed Data Analytics will increasingly be employed as a complement to existing information management systems and programs to identify actionable insights from a mass of Big Data. Separating good data from bad data will also become a rapidly growing service.

4. Advanced Cloud Computing Services

Businesses of all sizes will increasingly embrace new variations on public, private, hybrid and personal mobile clouds. This represents a major shift in how organizations obtain and maintain software, hardware and computing capacity to cut costs in IT, human resources and sales management. Not all clouds are created equal. Some are optimized for IoT applications, while others are designed for different levels of security and speed.

5. Virtualization of Storage, Desktops, Applications and Networking

The virtualization of hardware and software will see continued acceptance through growth in both large and small businesses as virtualization security improves. Hardware-as-a-Service (HaaS) is increasingly joining Software-as-a-Service (SaaS), creating what some have called "IT as a Service." In addition to the rapid growth of virtual storage, virtualization of processing power will continue to grow, allowing mobile devices to access supercomputer capabilities and apply them to processes such as purchasing and logistics. These services will help companies cut costs as they provide access to powerful software programs and the latest technology without the expense of a large IT staff and time-consuming, expensive upgrades.

6. Virtualization of Processes and Services (On-Demand Services)

The virtualization of processes and services will increasingly be accessed by companies needing to update and streamline existing services, and to rapidly deploy new services. The rapid growth of Collaboration-as-a-Service, Security-as-a-Service, Networking-as-a-Service, and many more, are all giving birth to Everything-as-a-Service.

7. Blockchains

Introduced as a means of transferring Bitcoins, blockchains are fast gaining traction in any number of areas. A system that enables secure digital direct transfers, blockchains decentralize transactions by eliminating the middle man, thereby allowing for direct connection among all involved parties. In addition to currency, blockchains can be used to transfer contracts, insurance policies, real estate titles, bonds, votes and other items of value. Given their security and lower cost, blockchains create a platform that will impact limitless products and services, thereby enabling innovation and growth.

8. Augmented Reality (AR) and Virtual Reality (VR) Apps and Devices

Augmented Reality will quickly become more common by adding just-in-time information to our physical world. Simply aim your smartphone camera at a crowded street to find the stores that have the exact products you're looking for. Conventional-looking glasses will allow wearers to overlay data on their fields of vision, providing useful information about what they're looking at. By contrast, virtual reality—using oversized headsets to provide an immersive, computer-generated 3D environment with which the wearer can interact—will grow more slowly due to the need for related software design and other forms of time-intensive development. Instead, growth in VR will focus on more specific industries. For instance, architects and designers can use VR to show potential clients specific features of buildings prior to actual construction.

9. Smart Virtual e-Assistants and Microphone Enabled Devices

The use of smart e-Assistants is accelerating, offering what is rapidly becoming a mobile electronic concierge available on any smart devices, including phones, tablets, televisions and cars. Stand-alone audio assistants such as Amazon Echo and Google Home will expand rapidly into business and governmental applications. Soon retailers will have a Siri-like sales assistant, and soon many of us will be using an e-Personal Health Assistant that taps into the real-time health data from a smart watch to predict potential problems and offer suggestions.

10. The Internet of Things (IoT) Becomes Increasingly Intelligent

Machine-to-Machine communications using chips, microsensors and both wired and wireless networks, will join networked sensors to create a rapidly growing Internet of Things, sharing real-time data, performing diagnostics, and making virtual repairs,all without human intervention. By 2020, there will be well over 50 billion "things" talking to each other, performing tasks, and making decisions based on predefined guidelines using artificial intelligence.

11. 3D Printing (Additive Manufacturing) of Finished Goods

Personalized manufacturing of finished goods using 3D Printing will grow exponentially. 3D printers build things by depositing material, typically plastic or metal, layer by layer, until the product is finished. Originally designed to print prototypes, they are increasingly being used to print final products such as jewelry, iPhone cases, shoes, car dashboards, parts for jet engines, prosthetic limbs, human jaw bones, blood vessels, organs and much more. This allows companies to manufacture one-of-a-kind or small runs of items quickly, locally, and with far fewer costs.

12. Smarter Smartphones and Tablets Drive Mobile Process Innovation

The vast majority of mobile phones sold globally have browsers, making the smartphone our primary computer. This signals a profound shift in global computing, allowing businesses of all sizes to transform the ways in which they market, sell, communicate, collaborate, educate, train and innovate using mobility. An enterprise mobility strategy that puts mobile first is rapidly becoming mandatory for organizations of all sizes.

13. Mobile Apps for Business Process Innovation

As we increasingly transform business processes using mobility, use of mobile apps for purchasing, supply chain, logistics, distribution, service, sales and maintenance will grow rapidly. There will be an increasing focus on Business App Stores within companies, giving users access to the personalized information they need on their mobile devices anytime and anywhere.

14. Mobile Banking and Payments
Mobile banking, using smartphones as eWallets, is already being used in an increasing number of countries. Use is finally taking off on a larger scale in the U.S., thanks to an increasing number of phones with secure mobile banking apps, Near Field Communications (NFC) chips, Biometric Identification and the use of Tokens where no credit card or personal information is exchanged.

15. Wearables and Applications
Wearables will increasingly be used for both personal and business applications. Apple's smart watch with health sensors and software joins Google, Samsung, Microsoft and others, as they battle for market share. This will drive further innovation and sales in other wearable technology. One example is a patch that can be attached to the skin for remote disease management, diagnostics and general health via wireless transfer.

16. Social Business Applications
"Social" takes on a new level of urgency as organizations shift from an Information Age "informing" model to a Communication Age "communicating and engagement" model. Social software for business will reach a new level of adoption with applications to enhance relationships, collaboration, networking, social validation and more. Marketers and researchers will employ Social Search and Social Analytics to measure real-time sentiment of large groups of targeted people.

17. Visual Communications for Business
Visual communication takes video conferencing to a new level thanks to free programs like Skype, FaceTime and others for video communication on phones, tablets and home televisions. Businesses of all sizes are rapidly embracing this as a primary relationship-building and communications tool.

18. Enhanced Location Awareness For Retail
Location awareness using in-building systems allows customers with smartphones to navigate stores and quickly find what they are looking for. This, combined with Geo-Social Marketing and Augmented Reality, will drive the creation of more business-to-consumer apps. In addition, Geo-Spatial Visualization combines Geographic Information Systems (GIS) with location-aware data, Radio Frequency Identification (RFID), and other location-aware sensors (including the current location of users from the use of their mobile devices) to create new insights and competitive advantage.

19. Drones Reach a New Height Adding AI
The number of applications for drones will continue to expand rapidly. Drones have already proven to be of high value for search-and-rescue, and are rapidly being applied to many industries. For example, agriculture uses drones to check crops, fences and cattle; utility companies use them to look for downed power lines; real estate agents use them for aerial photography. The explosion of hobby drones will drive innovation for both personal and industrial applications. AI will be increasingly integrated expanding capabilities far beyond today's applications.

20. Energy Storage and Micro Grids
Energy storage starts to become a reality as companies such as Tesla begin to sell their smart battery systems to businesses and homes that generate some of their own power using solar, wind or other systems. In addition, as first-generation hybrid vehicles get too old for the marketplace, there will be millions of batteries that will still hold enough of a charge to be repurposed into inexpensive energy storage systems. This will enable a national network of smaller and more secure smart Micro Grids.

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