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TECHNOTRENDS®
NEWSLETTER

The biggest ideas that are changing everything

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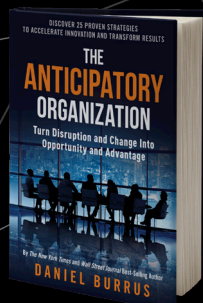
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12 Technology Categories That Will Transform Careers and Create New Ones

By Daniel Burrus, CEO of Burrus Research

As technology continues to impact our lives, workers at every level in today's ever-changing labor market need to be prepared with skills to adapt and succeed in the workplace.

The problem is, we live in an uncertain world, and because of the high levels of uncertainty we all face, people of all ages and career levels are finding it difficult to know what new skills to learn, what courses to take, and what degrees to get that will provide them with the most opportunity going forward. Uncertainty keeps us stuck in the present.

> "*I have developed a proven methodology to anticipate disruption and change before it happens*

Certainty, on the other hand, gives us the confidence to make a bold decision, to move forward with confidence, and to invest time and money to learn new things. Over the past thirty years, I have developed a proven methodology to anticipate disruption and change before it happens, allowing you to find the confidence that certainty provides.

This new science of certainty involves a scientific method of separating Hard Trends — trends that will happen — from Soft Trends — trends that might happen. This method is currently being used by many Fortune 500 companies, including IBM, Deloitte, and Pratt & Whitney to name a few, as well as the Pentagon to provide an accurate roadmap of the opportunities that are ahead.

That's why I wrote my latest bestseller, The Anticipatory Organization, and why I'm now helping you to connect the dots on how the 12 Hard Trends driven by technology I outline below will transform every career, and create new ones. By providing an accurate roadmap for anyone who wishes to increase their personal career relevancy in a world of transformative change, you can make career and education decisions with confidence.

The list highlights technologies that are now and will continue to transform present and future careers. As you read through the list, ask yourself how each one will play a key role in your industry and your personal career path.

1. Mobile Hardware, Software, and Interactive Services will continue to rapidly evolve, creating many new careers, as all phones become smartphones, wearable capabilities expand, and our primary computer and tablets continue to evolve as our laptop replacement. This new level of mobility will allow any size business to transform how it markets, sells, communicates, collaborates, educates, trains, and innovates. **Augmented Reality (AR)** and **Virtual Reality (VR)** will become increasingly mobile, playing a major role in direct and indirect job creation.

2. Remote Visual Communications is rapidly evolving into a primary relationship-building tool for businesses of all sizes as employees use smartphones, tablets, and laptops, in combination with current enterprise-level video

TECHNOLOGY NEWS HIGHLIGHTS

Re-Growing Neurons

Researchers in China have reportedly discovered a way to grow new brain cells, a breakthrough that could someday aid victims of stroke or brain injury in their recovery, as well as lead to a cure for a host of neurodegenerative diseases, including Alzheimer's and Parkinson's.

The technique involved injecting a cocktail of drugs directly into the brains of living mice, targeting a group of cells known as astrocytes. Although their role is primarily to support neurons, astrocytes are capable of certain signaling activity and are responsible for the plasticity of the central nervous system. They are also very plentiful in the brain, outnumbering neurons by 50 to 1. In addition, astrocytes tend to survive a stroke even when the neurons around them die off.

The chemicals are selected to activate specific genes within the astrocytes, effectively erasing their identity and replacing it with a new one.

After eight weeks, analysis of the brain tissue revealed that 80 to 90 percent of the astrocytes at the site of the injection had begun to display characteristics resembling neurons, including altered shape, gene activity, and changes to the way they transmitted electrical signals.

There is still much to learn about exactly what types of neurons are being created before the method can even be trialed on humans; for example, too many excitation neurons could trigger seizures. Different diseases also require different types of neurons for treatment; for example, a therapy for Parkinson's disease would primarily require neurons that produce dopamine. The next step will be to test the cocktail on mice that have experienced a stroke to confirm to what extent the treatment actually aids in recovery.

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Golden Rice

rice as a dietary staple, Golden Rice is viewed as an easy and inexpensive solution. The U.S. is the fourth country — behind Canada, Australia, and New Zealand — to approve the product.

For information: The Golden Rice Project; website: http://www.goldenrice.org/index.php

After more than a decade of data collection, Golden Rice has finally overcome a major regulatory hurdle, as it was cleared by the U.S. Food and Drug Administration to be safe for consumption. The grain, which was first presented as proof-of-concept research in 2000, is genetically modified to contain beta-carotene — a compound that is converted by the body into vitamin A, and is essential for proper function of the immune system. Vitamin A deficiency (VAD) is a major cause of childhood blindness and a significant health problem in developing countries.

Research has confirmed that the beta-carotene in Golden Rice can be converted efficiently into vitamin A without overdosing since the human body only converts what it needs and excretes the rest. Data also suggests that one cup consumed daily could supply up to 50 percent of the recommended daily allowance (RDA) of vitamin A.

Although Golden Rice has been a source of controversy and criticism from anti-GMO activists, the need to address VAD worldwide is clear. It is estimated that VAD accounts for one to two million deaths each year, as well as 500,000 cases of irreversible blindness. And because many of the countries affected rely on

Low-Light Solar Panels

The idea of harvesting sunlight from the photosynthetic dyes produced by bacteria and converting it into energy is not really new. But it has (in the past) relied on the difficult process of isolating those chemicals, which can be expensive and time-consuming. Now, researchers have found a way to bypass that step and simply use the bacteria to generate power. The new process reduces the cost of dye production to about one-tenth that of earlier biogenic cells, but the biggest benefit is that the new cells work as well in low light as they do in bright light.

E. coli bacteria were genetically engineered to produce large concentrations of lycopene, a red-orange dye that is very effective at harvesting sunlight. The bacteria were then coated with a semiconductor mineral and applied to a glass surface, which acted as an anode. The new cells generated a current density of 0.686 milliamps per square centimeter, which is almost double

that of other bacteria-based solar cells. The developers are confident that the design could be optimized to rival the efficiencies of conventional solar cells.

The innovation could lead to wider adoption of solar power in parts of the world where skies are commonly overcast. Other potential applications for the technology include mining and deep-sea exploration.

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Energy Storage for Floating Wind Farm

In fall of last year the world's first floating, offshore wind farm began producing energy. Called Hywind, the 30 megawatt plant has outperformed original expectations and currently provides renewable power to about 650,000 homes in the United Kingdom. Now, it has been coupled with battery storage to dynamically balance power between the offshore generators and an onshore substation.

The project, known as Batwind, integrates a one megawatt battery with a proprietary software package that instructs it when to store energy and for how long. It also controls when and how much power is injected into the grid. The goal is to make renewables smarter, more competitive, and more consistent in delivering power when and where it's needed.

Hywind's floating turbines extend more than 575 feet (176 meters) above the water, and are ballasted to float upright like a buoy. Although traditional fixed turbines are still more widely used, the potential for floating wind farms is huge. It has been estimated that up to 80 percent of potential offshore wind power is in deep water locations. The developers expect that more than 12 million homes will be powered by floating offshore generators by 2030.

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Quantum Diamonds

The holy grail of secure communication is quantum-encrypted data. But, as we've reported many times, storing quantum bits of information (or qubits) is not as simple as storing ones and zeroes. Qubits rely on a variety of subtle relationships between electrons, which

can easily be lost if the material in which they're being stored is unstable. In addition, qubits can only be transmitted short distances over optical cables without losing their special quantum properties, so they must pass through a series of repeaters to prevent degradation of the signal.

One challenge has been finding a suitable material to create a quantum repeater. Diamonds are good candidates, but even natural diamonds display too much variation to be useful. In fact, much of the work in the field of quantum optics to date has been performed with fragments of a single diamond from Russia that just happened to have the optimal characteristics.

Recently, a team of scientists crafted a synthetic diamond that is close to being able to support the desired photon wavelengths for quantum communication.

By reducing the amount of nitrogen and increasing levels of silicon and boron, the team, in partnership with an industrial diamond manufacturing company, has discovered a way to control the charge state of defects within the diamond, which is essential for maintaining the proper orientation to store qubits and transmit quantum information. The next step will be to interface the diamonds with photonic circuits.

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Bulletproof Batteries

On average, soldiers in the field carry about ten pounds of body armor and another eight pounds of batteries, so researchers at Oak Ridge National Laboratory are looking for ways to lighten their load by turning batteries into body armor.

The new technology makes use of a phenomenon known as shear thickening, in which a liqwuid becomes rigid when subjected to a high impact force. Shear thickening was achieved by adding silica nanoparticles to a battery's liquid electrolyte. Under normal operation, the electrolyte particles flow freely, but when hit by a physical shock (such as a bullet), the particles lock together and become solid — solid enough, in fact, to stop a bullet.

So far, the concept has only been tested on very small batteries, and scaling it up for larger form factors presents some challenges. For example, typical manufacturing processes involve injecting electrolyte into the battery, which would not be possible with a shear-thickening liquid. The goal is to continue research and build prototypes over the next year.

For information: Gabriel Veith, Oak Ridge National Laboratory, P. O. Box 2008, Oak Ridge, TN 37831; phone: 865-576-0027; email: veithgm@ornl.gov; website: https://www.ornl.gov/
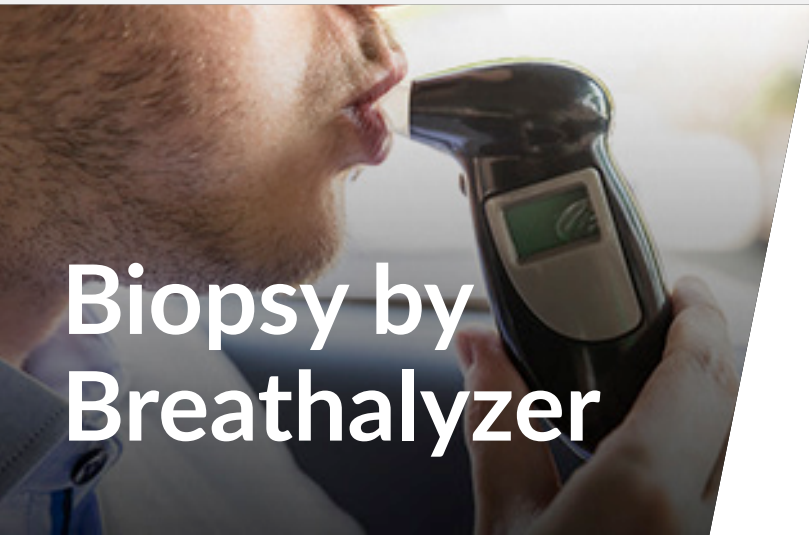
Biopsy by Breathalyzer

"Groundbreaking" AI

A new device has been developed that could enable earlier diagnosis of lung cancer, colorectal cancer, and other infectious and inflammatory diseases. Called ReCIVA (Respiration Collector for In Vitro Analysis), the system collects samples of exhaled air and ionizes VOCs to provide a chemical fingerprint of metabolic activity in the body. Particular patterns can be clearly correlated to early stages of disease, even before clinical symptoms become apparent.

Single-use Breath Biopsy Kits are used to collect the samples, which are then sent to a laboratory for analysis. A VOC Analyzer is also available for on-site analysis.

Availability is currently dependent on the completion of clinical trials and further diagnostic testing; however, the company hopes to release a product to the market late next year with a target price of $100. The developer also recently partnered with a major pharmaceutical manufacturer to research biomarkers that can identify chronic obstructive pulmonary disease (COPD).

For information: Owlstone Medical Ltd., 183 Cambridge Science Park, Milton Road, Cambridge CB4 0GJ, United Kingdom; phone: +44-0-1223-428200; website: https://www.owlstonemedical.com/

A new system called Artificial Intelligence Construction Engineering (ALICE) is being pilot tested on several building projects to determine whether or not it can significantly improve construction schedules. The system is given a 3D model of the proposed building from which it generates several million options for assembling it. Then, based on multiple parameters such as location, cost limitations, and availability of machinery and workers, ALICE selects a few of those options and begins scheduling how the work should be completed.

The plan includes specifying when people and equipment need to be on site, in what order things should be built, and how components will fit together. ALICE can also help to resolve schedule delays.

Around 20 companies are involved in the trial, which includes three multimillion dollar projects in Chicago and Seattle. In preliminary testing last year on a hospital that was already partially completed, ALICE reportedly still succeeded in cutting construction time by a couple of weeks. It's been estimated that using ALICE can cut project schedules by up to 16 percent while saving nearly 15 percent in project costs.

For information: Alice Technologies, Inc., 1040 Noel Drive, Suite 203, Menlo Park, CA 94025; phone: 833-254-2383; website: https://alicetechnologies.com/

12 Technology Categories That Will Transform Careers and Create New Ones

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conferencing systems combined with mobile conferencing apps, to communicate at new levels with customers, partners, and employees.

3. Social Business Enterprise Management will continue to grow rapidly as organizations shift from an Information Age "informing" model to a Communication Age "communicating and engaging" model. New careers will emerge as Social Software for business rapidly grows with applications to enhance relationships, collaboration, networking, social validation, and more. Social Search will increasingly shape careers as marketers, researchers, and those on Wall Street create applications and services to tap into millions of daily tweets, Facebook conversations, and much more, providing real-time analysis of many key consumer metrics.

4. Cybersecurity and Forensics careers will grow rapidly as we become increasingly connected and dependent on computer systems and machines using intelligent sensors connected to just about everything. Careers in data and information forensics will grow rapidly as the need to solve cyber crimes increases.

5. Additive Manufacturing (3D Printing) will create many new careers in manufacturing as this revolutionary technology allows any size company to manufacture quickly, locally, and with far fewer costs. Additive manufacturing builds things by depositing material, typically plastic or metal, layer by layer, until the final product is finished. Examples of final products

today include jewelry, iPhone cases, shoes, car dashboards, parts for jet engines, prosthetic limbs, and much more.

6. Virtual Reality (VR), Augmented Reality (AR), and AI enhanced Simulations, coupled with the Gamification of Education, will create many new careers as corporations and educational institutions at all levels accelerate learning by using advanced simulations, VR, and skill-based learning systems that are self-diagnostic, interactive, game-like, and competitive, all focused on giving the user an immersive experience thanks to a photorealistic 3D interface.

7. Advanced Cloud Services and Virtualization will be increasingly embraced by businesses of all sizes, as this represents a major shift in how organizations obtain and maintain software, hardware, and computing capacity. IT is rapidly becoming an on-demand service that is rapidly transforming all business processes, resulting in a rapid evolution of current careers as well as creating new careers in every functional area.

8. Big Data and Real-Time Analytics describe the technologies and techniques used to capture and utilize the exponentially increasing streams of data with the goal of bringing enterprise-wide visibility and insights to make

rapid critical decisions. This new level of data integration and analytics will require many new skills and cross-functional training in order to take advantage of new opportunities as well as break down the many data and organizational silos that still exist.

9. AI, Machine Learning, and Intelligent ePersonal Assistants (Chatbots) using natural language voice commands was launched with Apple's Siri, which was rapidly followed by Google, Microsoft, Amazon, and others all offering what is rapidly evolving into a mobile electronic concierge on your phone, tablet, and television. The technology will rapidly evolve, and soon every profession from retailers to maintenance workers will have an Alexa-like assistant. Adding an epersonal assistant to support an existing product and/or service will create many new careers.

10. 3D Web will transform today's Internet experience (which is like looking at a flat piece of paper with a few photos, embedded video, and a few hyperlinks) to a true 3D experience, similar to todays video games, where you can virtually walk into a showroom, look around, and both listen to and see the new car you are interested in, or whatever the website is trying to show you. This will employ many new graphic artists, designers, and programmers.

11. Connected Intelligent Sensors and Machines using chips, microsensors, and both wired and wireless networks will create a rapidly growing **Internet of Things (IoT)**, sharing real-time data, performing diagnostics, and making remote repairs. Many jobs will be created as we add intelligent connected sensors to bridges, roads, buildings, homes, and much more. In just a few years, there will be well over a billion machines talking to each other, and people will install them.

12. Advanced Robotics and Automation will take a giant leap forward thanks to networked
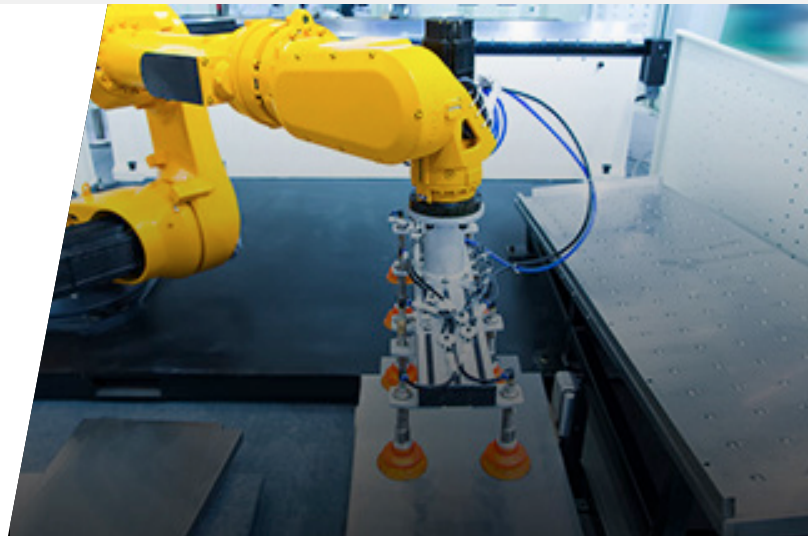
sensors, artificial intelligence, and Amazon-like voice communications, taking the next level of repetitive jobs from humans. This will create many new career opportunities from design, programming, and installation to service and maintenance to name just a few.

You don't have to know the physics of a telephone in order to use it. You do have to know it exists and how to creatively use it to accomplish your goal.

Don't wait until next year or the year after, or until you're laid off. Invest the time to identify what you need to learn right away so that you will thrive both now and in the future, either in your current career or a new one.

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