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TECHNOTRENDS[®] NEWSLETTER

*The biggest ideas that are
changing everything*

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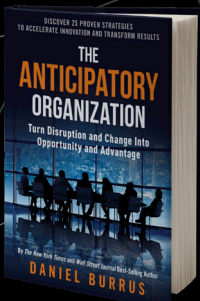
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Crossing the Street of Accelerated Change

By Daniel Burrus, CEO of Burrus Research

It's one of life's universal lessons: Look both ways before crossing the street. Parents have been impressing its importance on every generation since Henry Ford tinkered with the internal combustion engine.

However, many of us forgot that good advice, or assumed it didn't apply, when crossing from one decade of business into the next.

From the 1970s into the 80s, 90s and 2000s, the prevailing assumption was that the future would be relatively similar to the past, and that major changes only took place over long stretches of time, which provided plenty of leeway to adjust.

“ *Individuals and Organizations were blindsided by massive changes* ”

We stepped off the curb, looking straight ahead – and wham! Individuals and organizations were blindsided by massive changes. It happened to big companies like IBM, Motorola, Research In Motion, Sears and countless others.

4 Big Brands Who Were Blindsided

1. IBM. The original computer giant was late to act on the Hard Trends shaping the future of computing and missed the huge need for personal computers, entering the market late. Then in 2005, IBM sold its personal computer portfolio of products, including the popular ThinkPad brand, to Lenovo, which is

now the world's largest personal computing vendor. IBM was also late to embrace the Hard Trends of the increasing use of mobility and the cloud.

2. Motorola. Similarly, the historic telecommunications company failed to anticipate exponential changes of the early 21st century. Though it had many telecom firsts – first car radio, first handheld mobile phones in the early 1970s, and the first smartphone using the Google Android OS. Unfortunately, the Motorola Mobility branch relied on being Agile, reacting after a disruption occurs, while leading companies were Anticipatory, using Hard Trends to see the future first and jump ahead and stay there.

3. Research In Motion. The company's BlackBerry was the undisputed leader in business mobility with a highly usable mini keyboard and tight integration of mobile email and calendar functionality. When Apple released the first iPhone, Research In Motion's leadership failed to see the new future Apple had enabled and focused instead on making improvements instead of embracing the Hard Trends that were shaping the future of mobility and taking its loyal user base into the smartphone future.

4. Sears. Widely considered the first “everything” store, Sears had a winning business strategy: a notoriously large selection of goods in a catalog that was mailed to just about everyone, and products that were ordered were delivered right to the customer's home. Like many big brands blindsided by game-changing Hard Trends followed by disruptive

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TECHNOLOGY NEWS HIGHLIGHTS

Robotic Beetles

Researchers in Singapore have successfully created tiny flying robots by fitting beetles with miniature electronic “backpacks” and implantable electrodes capable of controlling their flight. The bionic hybrids allowed them to bypass the difficult task of building small robotic bodies and pose several advantages over battery-operated drones.

Electrodes were implanted into four flight muscles of male *Mecynorhina torquata* beetles. Small electrical pulses were administered to steer them left or right, and changing the frequency of the pulses was demonstrated to be effective at controlling their speed. The team is now looking at finding a means to alter their altitude as well as to hover in place. They are also learning how to care for their flying friends. Although the modifications did not appear to affect the lifespan of the beetles, it is not known whether invertebrates feel pain.

In addition to being less costly than drones, insects have flight times that are measured in hours rather than minutes, since they’re not limited by battery life. They are also better at adapting to turbulent conditions without the need for human intervention. Eventually, the bionic bugs may be equipped with carbon dioxide detectors and infrared sensors for search and rescue operations.

For now, demonstrating the technical possibilities of autonomous, insect-sized robots will undoubtedly fuel more research into how these insect-machine hybrids can be used.

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Long Distance Quantum Data



Personality Predictor

Quantum networks secure data using a technique called Quantum Key Distribution (QKD), which exchanges encrypted key information using photons. It's virtually impossible to hack because any attempt at intercepting the data will disrupt the quantum state of the light particles, which can be detected by the communicating parties. However, the photons can only travel short distances through optical fibers before they scatter, causing data rates to drop sharply.

Toshiba recently announced that they have developed a new protocol called Twin-Field QKD that will enable quantum data to be transmitted over distances of 500 kilometers at rates of up to 100 bits per second. Until now, the longest demonstrated range of QKD was about 400 kilometers at 1.15 bits per hour. Although conventional systems can be chained together to increase the total transmission distance, this requires intermediate secure stations in guarded locations along the entire route. The new protocol would allow sites to be connected at much greater distances and make it possible for organizations to network at a national or even international level.

For information: Andrew Shields, Toshiba Research Europe, 260 Science Park, Milton Road, Cambridge CB4 0GZ, United Kingdom; phone: +44-1223-436900; Web site: <https://www.toshiba.eu/eu/Cambridge-Research-Laboratory/>

Psychologists have long suspected that the way we physically view the world is determined by our personality. For example, curious individuals tend to look around more, while open-minded people will gaze longer at abstract images. It's no wonder, then, that scientists decided to test whether these unconscious eye movements can be analyzed using artificial intelligence (AI) to predict a person's personality traits.

A total of 42 students were asked to complete a questionnaire that rates people within the "big five" personality categories: neuroticism, extroversion, agreeableness, conscientiousness and openness. They were then given eye-tracking smart glasses to wear as they went about a normal routine of walking around campus and visiting a store. Although the test population was small, a few patterns emerged linking certain eye movements to specific personalities: Neurotic people typically blink faster, open-minded people exhibit bigger side-to-side movements and conscientious individuals showed larger fluctuations in pupil size.

Potential applications for such technology include personalizing interactions with robot companions, self-driving cars and even smartphones. But, as with any new technology, care must be taken to prevent information from being harvested and

used without a user's knowledge and consent, for example, to target political advertising based on personality.

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Turing Structures for Desalination

Occasionally, it takes decades for the work of a genius to be fully realized, and such is the case with Alan Turing. Although best known for his code-breaking abilities (Enigma in particular), many people don't realize that his interests extended far beyond mathematics. In 1952, Turing theorized that chemical reactions can create patterns, a concept that has since formed the basis for explaining everything from zebra stripes and leopard spots to sand ripples and crime "hotspots."

In very simplistic terms, Turing's paper described how patterns can result from two interacting ingredients if they have specific characteristics in which one is an "activator" and one is an "inhibitor." The activator self-replicates while the inhibitor prevents it from growing too near. The resulting pattern can be classified as one of two basic types: spots or stripes.

Inspired by this work, chemists in China have exploited these unusual surface patterns to create polymer membranes for desalination of sea water. By adding an activator and an inhibitor during the polymerization process, they were able to achieve an uneven surface structure that removes salt up to five times faster than conventional membranes without sacrificing flow rate. The discovery could greatly improve the efficiency of desalination, which is relied on by more than 300 million people for clean drinking water.

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Cord Blood Stroke Treatment

Initial tests using umbilical cord blood to aid recovery in stroke victims have shown some promising results. In a limited study, 10 stroke patients ranging in age from 45 to 79 were given a single infusion of blood from the umbilical cords of newborns. The period between the onset of the stroke and the time the injection was administered ranged from three to 10 days, and all volunteers were evaluated three months later. All showed improvement in speech, vision and movement, and their assessment scores were higher

than would have been predicted without the treatment.

This result appears to agree with earlier animal experiments, which indicated that the stem cells encouraged new brain cell growth and suppressed inflammation. A larger controlled trial is now underway to confirm the findings.

It has been estimated that, in the United States alone, nearly 800,000 people suffer from a stroke each year, and 40 percent will experience severe impairments requiring specialized care.

Clot-busting drugs often cannot be used because they must be administered within five hours in order to be effective. New forms of treatment are urgently needed to improve outcomes and quality of life.

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compounds called polyphenols to slow the process. Most of these stabilizers are petroleum derivatives, but a new polyphenol-rich “cocktail” made from grape skins, stems and seeds could provide an eco-friendly alternative.

Scientists took the leftovers from winemaking (called marc) and cooked it for 20 minutes in a microwave. The resulting liquid was then freeze dried and mixed into melted polypropylene – a plastic that is commonly used to make reusable containers.

Compared to plastic with no added stabilizers, which cracked after 25 hours of exposure to air and ultraviolet light, the plastic treated with the grape stabilizers lasted twice as long. And when baked in a dark oven at 175 degrees Fahrenheit (80 degrees Celsius), the untreated plastic broke down after only seven hours whereas the grape-treated plastic lasted 94 hours.

The eco-friendly stabilizer still doesn't work as well as the commercial petroleum-based stabilizers currently in use, and the developers caution that the results may be somewhat variable based on year-to-year changes in climate and growing conditions, which can affect the polyphenol concentrations in the marc. However, the fact that it utilizes biowaste instead of petroleum warrants further research.

For information: Audrey Diouf-Lewis, University of Clermont Auvergne, 49, bd Francois Mitterand, CS60032, 63001 Clermont-Ferrand, France; phone: +33-4-73-17-7979; Web site: en.uca.fr/



Eco-Friendly Plastics

Oxidation causes plastics to become brittle when exposed to air and light for extended periods of time, so manufacturers add antioxidant



Optical Laser Monitor



Virtual Customer Service

Clinical trials are currently underway for a new monitoring device that can detect a variety of vital signs without even touching the patient. The sensor uses a laser, camera and special optics to capture nano-vibrations related to the movement of internal organs, as well as sounds and chemical compounds. It can be linked to a variety of smart devices including tablets and smartphones to provide users with an easy and affordable way of monitoring their health.

To capture cardiac and respiratory measurements, the laser illuminates a person's chest while the camera records the backscattered light. Software is used to analyze movements from respiration and heartbeats that would be barely perceptible to the human eye. The device works up to three feet away and can detect parameters like heart and respiration rate through clothing.

Other measurements include cardiac and respiration sounds, blood pressure, glucose and alcohol levels, and muscle movement. In addition to simplifying solutions for consumer health and clinical care, the company is planning to license the platform for use in automotive and industrial applications.

For information: ContinUse Biometrics Ltd., HaBarzel 32b, Tel Aviv 6971048, Israel; phone: +972-77-521-5560; email: info@cu-bx.com; Web site: <https://www.cu-bx.com/>

A new text-based customer service agent has been developed that accurately resolves issues as much as 90 percent of the time. The developer claims that the new artificial intelligence (AI) system – known as Amelia – is close to becoming indistinguishable from humans.

The system was originally built by analyzing the text interactions of hundreds of well-trained customer service agents. An automated avatar processes transactions and answers questions through a chat window. Actual human agents monitor the conversations and guide Amelia through complex requests, which are then incorporated into the AI semantic memory. By storing facts, concepts and associations between them, Amelia can retrieve information across a complex knowledge base quickly and reliably.

Because Amelia can handle thousands of requests simultaneously – day or night – it increases labor productivity while providing round-the-clock coverage and frees up humans for more creative endeavors. The system can be designed according to specific business processes and procedures to address a variety of corporate needs and roles.

For information: IPsoft Inc., 17 State Street, 14th Floor, New York, NY 10004; phone: 212-708-5500; Web site: <https://www.ipsoft.com/amelia/>

Crossing the Street of Accelerated Change

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innovation, Sears didn't see how serious competition had become – for both brick and mortars like Walmart and online-only retailer Amazon. The company's past success and organizational ego limited its view of the future.

Based on these and other painful experiences, the prevailing assumption was dramatically adjusted: Change is speeding up – get used to it. But then with each passing decade, crossing the street of change became an exercise in advanced risk analysis. Dodging oncoming traffic was the name of the game.

Seeing Change Is Only Part of the Solution

Spotting technology-driven change provides only part of the solution, however. Literally thousands of important high-tech breakthroughs are zooming at us from left and right. Not only do we need to carefully look both ways, it is essential to actually see and understand the ramifications of what's coming.

Hopping out of the way in a panic or jumping on board the next new thing isn't the answer, nor is taking a wait-and-see attitude. By reinventing how we look at technology-driven change, it is possible to reinvent the way we think about change. Once that happens, the reinvention of how we act in response to change takes place.

Look. Think. Act. These distinct steps are the key to both finding and profiting from the many new opportunities that are headed our way.

Technology-driven change has been a ferocious problem for all of us because it comes from so many sources and directions at once. The U.S. Patent and Trademark Office awarded nearly 335,000 patents in

2003 and 2004. By 2015, the number had increased to 629,000 (uspto.gov, Statistics Chart, retrieved May 2018).

Those numbers are both impressive and depressing, especially for those who thought the pace of technology-driven change would let up by now.

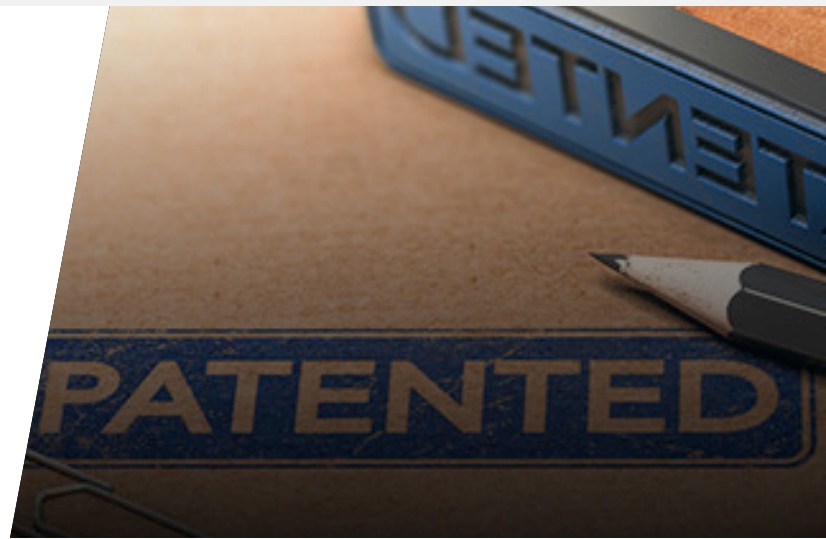
Taking Acceleration from Infinity Down to Three

Soon, there will be a million new things out there waiting to happen. Is it humanly possible to keep up? You don't need to. In this article, I will slash the number by 999,997. If you're doing the math, you'll see I have reduced the tech-driven change onslaught down to three.

This math is admittedly fuzzy because it is impossible to precisely calculate how many significant high-tech developments are emerging. The key point, however, remains: The catalyst for transforming our businesses and futures is generated primarily by only three technological forces.

Three Digital Accelerators

Three of the most powerful digital trend accelerators – computing power, digital storage and bandwidth – have reached an intense new phase and are already turning business models upside down as they spawn fresh generations of procedures, tools, products and services.

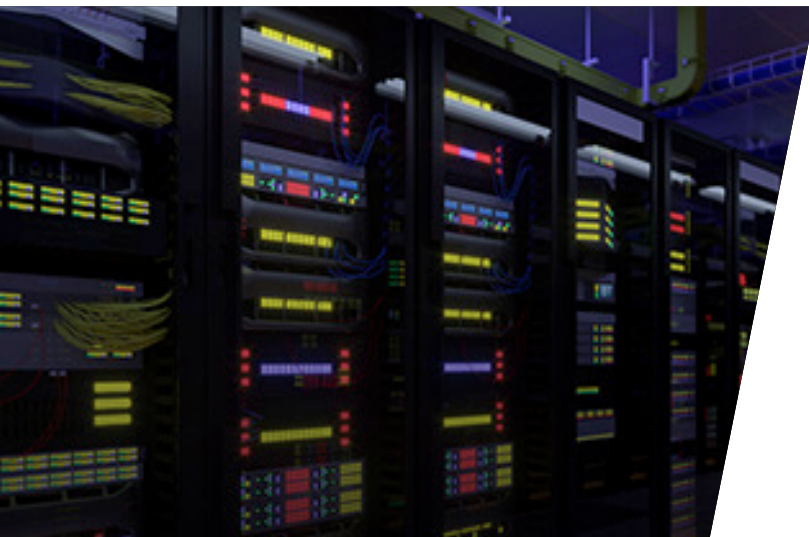


By focusing on the Three Digital Accelerators instead of only focusing on the dozens of new technologies covered by the press each month, we can get a more accurate sense of where technology-driven change is coming from and where it is likely to lead.

The terms “computing power,” “digital storage” and “bandwidth” are not new, but it is imperative to realize that their newfound power will continue to have a major impact on the future.

We are all just now entering a new technology-driven change curve that will create more personal and organizational change than you have seen since 2010. Unlike the past 25 years, this change curve is much steeper and will cause far more disruption and opportunity.

Let's take the three accelerators one at a time.



Computing Power

“Moore’s Law” states that computer processing power doubles every 18 months. It has been that way since the mid-1970s (when the rate slowed somewhat) and, thanks to constant innovation, it shows no convincing evidence of abating again.

Gordon Moore, the co-founder of Intel, first made

this observation in 1965, and his name has been attached to it ever since.

What’s driving Microsoft 365? Moore’s Law. What’s behind our ability to wear a computer on our wrist? Moore’s Law. What’s behind connected speech recognition products like Alexa? Moore’s Law. What makes self-driving cars go? Moore’s Law.

***Special Note:** When I first identified the Three Digital Accelerators in 1983, I used the term “processing power” as one of the three accelerators. Thanks to our ability to access supercomputers in the cloud from any of our smart devices, we have recently gone beyond using processing power and Moore’s Law as a key driver of exponential change, and moved to the exponential growth of the entire computing ecosystem in the cloud. That is why I now call this element “computing power.”*

Digital Storage

The second digital trend accelerator is storage. The capacity to store digital data is doubling every 12 months, even faster than computer processing power.

One great example of storage acceleration comes from the evolution of Apple products. What could once be stored on an iPod, one of the first smart music storage devices, could later be stored on an iPhone along with photos, video and much more.

Having a terabyte of storage on a thin laptop was unthinkable to many just a few years ago; now it’s common. Having large servers on location was the norm not long ago; now we use virtual servers in the cloud with seemingly unlimited storage potential.

Bandwidth

Finally, there’s bandwidth. Screamingly fast bandwidth, which is doubling every nine months, was primarily generated by advances in fiber-optic

technology and, more recently, the implementation of new wireless broadband technology.

Using a dial-up modem not that long ago was good for email and documents only. Today, we can stream high-definition video to our phones, wearables and much more. 5G will be followed by 6G, 7G and beyond, opening new pathways to innovation.

Sweeping Change

The relentless doubling of computing power, digital storage and bandwidth form the epicenter of sweeping large-scale innovations that will continue to transform how we live, work and play for the foreseeable future.

For example, the American Society of Mechanical Engineers predicts that nanotechnology will have been applied to virtually every aspect of our lives (industry, medicine, new computing systems and sustainability) by 2020 (amse.org, Top 5 Nanotech Trends, retrieved May 2018).

Artificial Intelligence, machine learning, chatbots and robotics are a few other advancements destined to be extremely potent change agents as their development is accelerated by the concentrated forces of computing power, digital storage and bandwidth.

Transformation

A statistical model showing the doubling of the number 1 every year would display data points on a curve that rises gradually for the first five years, turns sharply steeper at 10 years out, then quickly blasts off toward a 90-degree ascent and goes straight up and off the chart.

If we look at the history of processing power alone, this exponential growth rate has been occurring for 40 years.

For example, to go from a 5-megahertz chip to a 500-megahertz chip took 20 years; however, the jump from 500 megahertz to 1 gigahertz (1000 million hertz) took place in only eight months, and that was a number of years ago. We are way beyond that now.

The pace is astounding. The other two technologies have been at it for a couple of decades and are racking up even hotter numbers. For example, companies such as Cisco have recently created methods for increasing broadband speed between 400 and 1,600 percent.

What the resulting vertical lines on the chart tell us is that transformation is now replacing change as the business headache du jour.

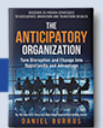
Disruptive change is only disruptive if you didn't know about it ahead of time. Now that you know the forces that will drive the change curve higher, it is imperative that you focus on being Anticipatory by identifying the Hard Trends that will shape the future and take advantage of the game-changing opportunities they are creating for developing new products and services that are coming our way.

FAST COMPANY

"If you're in business and you're not thinking about disruption, you're not paying attention. And if you haven't read The Anticipatory Organization, you haven't learned how to think about—and get ahead of—the disruption that's headed your way. Read this book!"

—Alan M. Webber Co-founder, Fast Company Magazine

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