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# TECHNOTRENDS<sup>®</sup> NEWSLETTER

*The biggest ideas that are  
changing everything*

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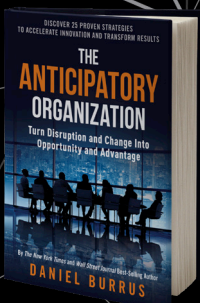
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## How Multi-generational Collaboration Can Help Us Find Success in Manufacturing

*By Daniel Burrus, CEO of Burrus Research*

We as humans like to categorize. Whether it be genres and subgenres of music, which mobile apps that all accomplish something similar are best to worst, or which foods are the healthiest. But the area we find ourselves categorizing the most today is our generational differences in the workforce, success and what success means to different generations, especially in manufacturing.

In recent years, the change curve of manufacturing has gone from an overly static line to a much more extreme slope. There was a time when we all knew what manufacturing was, and it was safe to assume we knew where it was headed.

Technological change is uprooting that sedentary thought, and the change curve of manufacturing has become more of an upward climb. Essentially, what the industry and job market of manufacturing was isn't what it is now or what it will eventually become.

*Success as an employee of a manufacturing company has a whole new meaning.*

That change curve also has an effect on what manufacturing jobs will be in the future, as opposed to what they were in the past. And that hard trend changes how we categorize success and what it means. Success as an employee

of a manufacturing company has a whole new meaning. Much like how we knew where jobs were in manufacturing and where they were headed, we used to have a polarized view of what success meant.

For many baby boomers in manufacturing, it meant working at a company until you retired. It meant doing the repetitive and often dirty jobs to make ends meet. Whatever it meant, the paycheck at the end of the week was a physical depiction of your success as a worker.

The younger generations entering the workforce have an entirely different view on life, success, and jobs in general, let alone jobs in manufacturing. Digital technology, additive manufacturing (3D printing) and the internet of things (IoT) are already here and, in most cases, making our lives easier; however, the millennial generation and younger have grown up with technological advancements exclusively.

Everyday tasks that used to take a baby boomer a distinct amount of time to accomplish has been drastically shortened by the use of mobile apps or 3D printing to accomplish the same task, and younger generations have adapted these realities as a constant in their lives with ease.

Take, for example, telecommunications. Baby boomers grew up with the landline

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TECHNOLOGY NEWS HIGHLIGHTS

# Smartphone Spectrometer

A new lab-on-a-chip that's small enough to fit inside a smartphone could change the way consumers shop for food. Known as Hertzstück, the prototype sensor is actually a miniature spectrometer that can identify the chemical make-up of a wide variety of materials, including food, textiles, and other consumer products.

Four tiny incandescent lamps illuminate a sample with low-intensity infrared radiation. Each chemical component of the sample will vibrate at a unique frequency, which can be compared to a database of known infrared signatures to determine its composition. A smartphone app analyzes the signals and displays the results. The device will help farmers by identifying whether the herbicides and pesticides they are using are genuine or substandard counterfeits, and by determining the best time to harvest crops. But an even bigger market could come from testing for

“food fraud” and adulteration, a major concern in the food industry today.

The ability to analyze food on the spot will enable consumers to identify products that have been deliberately mislabeled — such as olive oil that has been mixed with sunflower oil, or high fructose corn syrup that is being sold as honey. In these days of escalating food counterfeiting, it may prove to be especially important for avoiding reactions to potentially harmful allergens, such as peanuts, wheat, or dairy. The technology can even be used to analyze the fiber content of clothing — including silk, cotton, and polyester — to make sure that buyers are getting what they're paying for.

For information: *trinamiX GmbH, Industriestrasse 3, 67063 Ludwigshafen, Germany; phone +49-(0) 621-60-97165; fax +49-(0) 621-60-66-42082; email: [info@hertzstueck.de](mailto:info@hertzstueck.de); website: <http://www.hertzstueck.de/>*

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# Universal Cancer Detector

A new test has been developed that could be used to diagnose any type of cancer in less than 10 minutes. The breakthrough was based on the discovery of a DNA nanostructure that appears to be common to all cancers but is distinct from healthy cells.

Tiny molecules called methyl groups are present in all DNA and function to regulate which genes are turned on and off. In healthy cells, the methyl groups are spread out across the genome. But in cancerous cells, they form clusters at very specific locations. The team discovered that when placed in a solution, these intense clusters formed three-dimensional structures that could be detected using a high-resolution microscope. They then mixed gold particles into the solution, which allowed them to determine whether the three-dimensional structures were present simply by observing a color change.

So far, the researchers have tested the procedure on more than 200 tissue and blood samples that include breast, prostate, bowel, and lymphoma cancers, with an accuracy of about 90 percent. The next step will be to expand the clinical study to include more patients and other types of cancers. They will also be considering whether the test can be useful for monitoring a patient's response to

treatment by quantifying the levels of cancer DNA in body fluids.

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# Text and Data Mining with AI

A new artificial intelligence (AI) system called LION LBD uses machine learning, natural language processing, and text mining to help researchers uncover links between data sets from millions of scientific studies. The literature-based discovery (LBD) technique was originally developed as a painstaking manual process in the 1980s, but computerization has made it a practical tool for finding patterns that humans would never have detected.

The first iteration of LION LBD is focused on cancer research due to the massive volume of research available across multiple scientific disciplines. The sheer amount of data makes it impossible for scientists to keep up on all of the latest information, much less associate concepts from a variety of sources. LION LBD enables real-time search of tens of millions of publications and allows users to examine the data in its original context.

Currently, the system can only connect two keywords or concepts, but the developers have made the entire system open source and freely accessible to allow for collaborative development moving forward.

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## Spider Silk from Bacteria

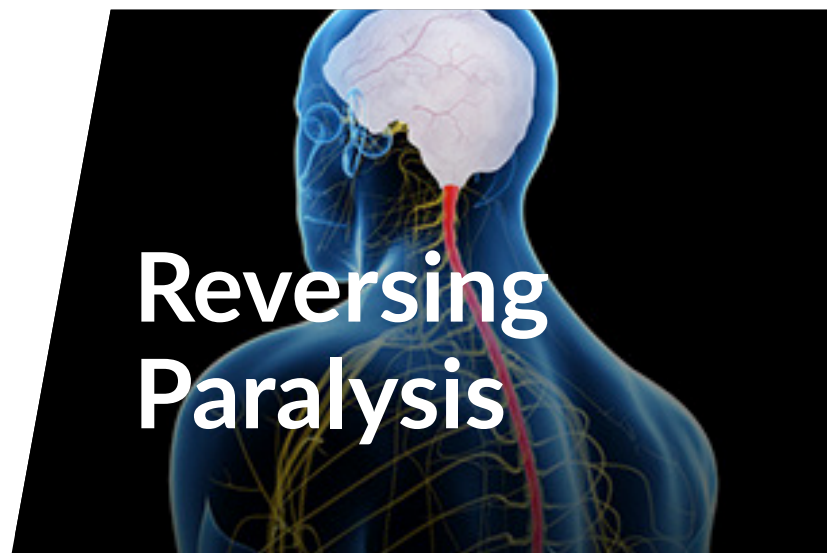
Spider silk has long been prized for being strong, flexible, biodegradable, and nontoxic. It's widely used for sutures, bulletproof vests, and athletic gear, but is difficult to farm in large quantities. So, for decades, scientists have tried to come up with a synthetic version that mimics the real thing. Previous attempts have included transplanting spider DNA into a variety of organisms including silkworms, plants, and goats. But the best synthetic fibers have only been about half as strong as natural spider silk.

Along the way, they did learn that the secret to spider silk's amazing strength are large protein molecules made up of long amino acid strings encoded by repetitive DNA sequences, which nature generally tries to avoid, but which spiders have found a way to preserve. So researchers engineered bacteria using modified spider DNA to produce silk protein

molecules that glue together to form longer protein strings. These were ground into a powder and mixed into a solution that could be spun into fibers as strong as natural spider silk.

The current process may still be too costly for large-scale production, as it requires use of an expensive solvent. The next step will be to see if similar results can be achieved using a water-based solution.

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## Reversing Paralysis

A recent study has demonstrated that chronic paraplegia due to spinal cord injury may be reversible through electrical stimulation. And, unlike previous studies, neurological function was shown to persist even after the stimulation was turned off.

The researchers in charge of the study credit the success of the procedure to a thorough understanding of the way in which the brain naturally communicates with the spinal cord. An array of electrodes activates specific spinal regions to mimic the signals that the brain would normally produce. The exact

timing and location of the stimulation is essential to not only trigger movement but also to grow new nerve connections and strengthen those in parts of the spine that are still intact.

The study was composed of three patients, all of whom had partially crushed spinal cords and were unable to walk. All three participants were able to walk (with support of their body weight) after only one week of learning how to coordinate their brain with the electrical stimulation and movement. Over the course of several months, they were able to walk hands-free over a distance of one kilometer, and motor function was improved even when the stimulation was turned off.

The developers believe that, if used sooner following an injury (before the neuromuscular system has atrophied), the technology should have an even greater potential for recovery.

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devices used on fighter planes and missiles, and even detect stealth aircraft.

Theoretically, quantum radar is a remote-sensing technology that works by creating two entangled photon streams — pairs of photons that are connected in such a way that any change to one of them can be detected by the other. One stream is sent to a distant object while the other stays in the system. When the sent photons reflect off the object and return to the system, they are matched with the unsent photons so that all background noise can be filtered out, leaving a clear image of the target. Aircraft that are exposed using the technology would also be unaware of being detected.

Quantum radar systems could also enhance signal-to-noise ratios in situations where environmental phenomena such as geomagnetic storms and solar flares interfere with traditional radar operation. Although the reports of successful tests have not yet been confirmed, this technology would make it more difficult and dangerous for stealth aircraft to fly undetected.

*For information: China Electronics Technology Group; website: <http://en.cetc.com.cn/>*



## Quantum Radar

A Chinese defense giant claims to have successfully built a quantum radar system that would be capable of filtering out radar jamming



## The Future of Glass

The evolution of smartphones has drastically changed the way we think about glass. By

adding different elements to the basic mix of silica and heat, manufacturers have created glass that's tougher and more durable than ever. But the next generation of foldable phones is just around the corner, and while plastics are the current material of choice for bendable displays, over time they are notorious for scratching, creasing and changing color. So glass makers are stepping up to produce glass that can handle the tight bend radius, yet still deliver the scratch resistance, drop resistance, great tactile feel, and good optical properties that consumers demand.

Although it's still in the laboratory, Corning is developing glass that can be made thinner than a human hair to compete with polymer displays and flexible OLEDs. Expect glass manufacturers to continue pushing the envelope as these technologies continue to evolve.

*For information: Corning Incorporated, One Riverfront Plaza, Corning, NY 14831; website: <http://www.corning.com/worldwide/en.html>*

communication satellites. The system will not only bring global coverage to otherwise inaccessible places, it will also enable data to be sent twice as fast as optical fiber networks that are currently used to connect to the internet.

The key to increasing speed comes from the fact that, once information has been sent to space, it can be beamed from satellite to satellite using lasers — and sending light through space is much faster than sending light through glass. While this may not be important for a typical user, some applications will benefit from the faster speeds.

For example, large banks that rely on high-frequency trading would likely be willing to pay for faster speeds in a world where fortunes can be made and lost in a matter of milliseconds. For this reason, the satellite coverage will be increased over large international trading centers including London, Paris, and New York. Subscription services will be critical to building and maintaining Starlink, as each satellite will likely last only a few years. This means that new satellites will need to be launched every few weeks (at an estimated cost of tens of millions of dollars each) just to maintain the network.

The first Starlink satellites are scheduled to be launched in 2020.

*For information: Teslarati; website: <https://www.teslarati.com/spacex-starlink-gains-fcc-approval/>*



SpaceX was recently given permission by the United States Federal Communications Commission (FCC) to deploy Starlink, a network of over 4,000 low-Earth orbit (LEO)

# How Multi-generational Collaboration Can Help Us Find Success in Manufacturing

*continued from page 1*



telephone, multiple landlines and cordless phones as an appliance. Millennials see a desktop, laptop and smartphone with instant messaging as an appliance. And finally, the generations even younger already see their mobile devices including wearables that allow them to communicate often with only emojis as an appliance. We all categorize, but the categorization is changing with the times.

So, with the changes in manufacturing jobs, how different generations adapt to technology and what they consider success to be is quite different. Plus, the fact that many baby boomers are not retiring out of their jobs as fast as younger generations are starting in the same industries, putting an additional strain on the generational divide. First, we need to define what success actually means. Does success mean loving what you do, but not necessarily

doing something specific?

The future of success, to the generations entering the workforce, has much to do with how much they love what they do, rather than just getting a job. The baby boomer generation measured success much differently; however, if they plan on staying successful in their jobs, they must become more open-minded with these trends and, more importantly, end the categorizations that further the divide between the young and the old.

All generations need to rely on each other more than ever before, as life expectancy is much longer than generations prior, meaning more generations will be working together for the first time in our history. While young generations may learn about “the old school work ethic” from past generations, older generations can and should learn from younger generations about how to apply new tools, think out of the box, and reinvent the industries they are in, especially our example of manufacturing.



For example, automation is getting more intelligent, capable, and widespread whether we like it or not, and those back-breaking, repetitive jobs discussed earlier will be increasingly taken



over by machines. This shouldn't be viewed as a bad thing; however, many of the older generation worry about losing their jobs to robots, and feel that technology may make us weak or lazy, whereas the younger generation is learning in real time how to embrace this change and find careers alongside it. Radically new innovation isn't something to fear, though older generations do tend to fear it rather than embrace it, learn from it, and adapt to it.

are shaping the future. You should be asking yourself questions about how your career is evolving, how we as humans are evolving, how can I embrace new technology as easily as I embraced the technology I grew up with, and how can I have an open mind and learn from different generations instead of categorizing everything as old or new, useful or useless, successful or not, and so on.

This can change the dynamic of the manufacturing workforce, embracing new technology as it comes, but also learning from the past to foresee potential problems of the future and pre-solving them before they happen.

Are you anticipating the future of your career? If you want to learn more about the changes that are ahead and how to turn them into an advantage by becoming anticipatory, pick up a copy of my latest book, [The Anticipatory Organization](#).



The same can be said for older generations teaching younger generations about their work ethic and the importance of integrity, trust, and how to earn those things in the workforce. Their gold is their experience.

Forty years of experience can't be taught via YouTube or a TED talk. But it can be taught in on-the-job communication, collaboration, and mentoring with a younger worker who's just starting out in manufacturing. Some things automation will not replace, and all generations can learn to thrive in the future from each other.

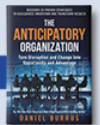
Because we are going to spend the rest of our lives, both professional and personal, in the future, perhaps we should spend some time identifying the future facts, the hard trends that

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

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