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Underdogs to "Wonderdogs":

Technology Trends for 2021 & Beyond

by Steve Andriole, Fellow, Cutter Consortium

Each year, research organizations publish lists of the top technologies to watch in the new year. Many of these trendy "celebrity" technologies appear on every list we see. But what about the ones that don't always make the lists but are important to our personal and professional lives? In this *Executive Update*, we present a list of seven underdogs — technologies to watch closely. Look out — they just might become "wonderdogs" in 2021 and beyond.

As each year closes, just about every technology research organization publishes a list of the top five or top 10 technologies to watch in the new year. Many of the technologies appear on every list. For example, artificial intelligence (AI), machine learning, Internet of Things (IoT), blockchain, cybersecurity, distributed clouds, and privacy technology are on almost every list we see. Some of these technologies appear year after year — these are the easy trends. But what about the technologies that don't make the lists? What about the underdogs?

The Underdogs

In this *Executive Update*, we take a closer look at seven underdog technologies that might have a major impact on our personal and professional lives in 2021 and beyond. A few of them have made some lists, but, by and large, they're missing. These technologies are:

1. Surveillance technology
2. 3D technology
3. Homomorphic encryption
4. Low-code/no-code (LC/NC) programming
5. GitHub
6. Immersion technology
7. Cryptocurrency

Let's look at each — one by one.

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Surveillance Technology

Surveillance technology enables all kinds of good and evil opportunities. Marketing loves surveillance. Retailers love it, too. But what happens when facial recognition technology fails? Or when surveillance encroaches on privacy, which it already does? Body cameras,

biometrics, drones, facial recognition, RFID, GPS, big data analytics, IoT, social media, and the like, enable tracking, profiling, manipulation, rewards, and punishment. Yet, surveillance technology does not receive the same kind of attention like AI, for example. But taken together, surveillance technology will be as impactful as any of the "celebrity" technologies in 2021 and beyond.

3D Technology

3D technology is broadening its impact — and fast. It's an underdog today, but in a year or two, it will be a celebrity.

3D technology is broadening its impact — and fast. It's an underdog today, but in a year or two, it will be a celebrity impacting all aspects of modeling, simulation, printing, and manufacturing across various industries, including education, medicine, and construction. 3D models will continue to impact video games, architecture, engineering, and advertising. 3D manufacturing already generates simple and complex objects, including, among many others, automotive parts, eyewear, prosthetics, sculptures, and even firearms. How does this technology fail to make any top 10 lists, especially when 3D tools are better, faster, and cheaper than ever before?

Homomorphic Encryption

Fully homomorphic encryption (FHE) is a technology that makes a few lists but is generally way too underhyped. FHE is encryption without decryption, which means it enables "private" data analytics without demasking the data. In healthcare, for example, FHE enables analytics without violating the privacy of patients. It revolutionizes the way big data analytics are analyzed for explanatory, predictive, and prescriptive purposes. Microsoft has invested in FHE through its Simple Encrypted Arithmetic Library (SEAL) program. IBM and Google have also invested in FHE. The technology will eventually be standardized for widespread use. Definitely an important trend.

LC/NC Programming

LC/NC development platforms make programming accessible to nonprogrammers. This alone should give LC/NC platforms superstar status, but they remain tucked in the world of software engineering. LC/NC platforms are fundamentally changing the way we build applications by reducing the gap between requirements and development, between business and engineering. They accelerate development and open participation to lots of nonprogrammers previously shut out of the design and development process. How is this not one of the most impactful technologies of all time? How is it not on every top 10 list? Would computer-aided software engineering (CASE) and rapid application development (RAD) tools have made the lists when they started making ground? What about 4th-generation languages (4GL)? LC/NC platforms are far more impactful than CASE, RAD, or 4GL. They're anything but underdogs.

GitHub

Just as "citizen developers" love LC/NC platforms, programmers love GitHub and other open source code repositories.

Just as "citizen developers" love LC/NC platforms, programmers love GitHub and other open source code repositories. GitHub makes it easy to contribute, document, manage, and integrate code in an open source platform that's exploding in size and use. It also serves as an online programming résumé for those seeking fame and fortune as software engineers. GitHub makes everything faster and cheaper. So why isn't everyone talking about GitHub? Microsoft obviously felt GitHub was important enough to buy it for US $7.5 billion. It's also the world's greatest code repository with over 40 million users and 190 million repositories. So add it to the list of underdogs under-represented in most top 10 parades!

Immersion Technology

Immersion happens today mostly through augmented and virtual reality (AR/VR) applications that ideally occur via headsets designed to optimize the immersive experience of customers. While AR and VR are available on other devices, the experience is less fulfilling. So where's

the underdog? AR and VR will become cost-effective for personal use as professional applications expand across gaming, education, and retail domains — and beyond. Headsets will eventually yield to 3D immersive laptop/desktop displays, rivaling the headset experience, even as headsets become smaller, faster, and cheaper. Micro-optical lens technology will enable this experience, which means that immersion can occur on screens — even heads-up displays on windshields. Partial or full immersion will transform all forms of entertainment, especially sports. Imagine the range of possible applications. So how could immersion still be an underdog?

Cryptocurrency

The number of retailers and Internet sellers that accept cryptocurrency for payment is growing — and will continue to grow. An underdog? Not for long.

Bitcoin was doing just fine until PayPal added some serious credibility to both its use as a currency and as an investment opportunity. Bitcoin millionaires and billionaires aside, there are now serious investment opportunities in Bitcoin, Ethereum, and other cryptocurrencies that might make sense for a highly speculative portfolio. Cryptocurrency exchanges such as PayPal and Coinbase enable such investments. But perhaps even more important is the role that cryptocurrency will play in fast, secure, and borderless transaction processing. The number of retailers and Internet sellers that accept cryptocurrency for payment is growing — and will continue to grow. An underdog? Not for long. As more companies accept cryptocurrencies, and more investors bet on cryptocurrency, it will graduate to the top 10. Perhaps the best clue is the current availability of Bitcoin gift cards.

Becoming "Wonderdogs"

Research organizations love celebrity technologies. They're easy to identify and hype. Many are, in fact, impactful in any given year. But what about the underdogs? Can they become wonderdogs? All it takes is evidence and, as always, a fair amount of packaging and messaging. But the best path to promotion is deployment. As more and more companies deploy these underdogs, the faster they'll become wonderdogs. Maybe next year they'll make the list.

About the Author

Stephen J. Andriole is a Fellow with Cutter Consortium's Business Technology & Digital Transformation Strategies and Data Analytics & Digital Technologies practices and the Thomas G. Labrecque Professor of Business Technology at Villanova University. His specialty areas include digital transformation, emerging technology trends, cloud computing, social media, technology due diligence, software IP valuation, business technology strategy, business technology management, technology governance, business technology organization, the business value of technology, and technology performance management. His acclaimed column in *Forbes* features such articles as "15 Must-Have Technology Capabilities for Digital Transformation," "Your Technology Skill Crisis — See It Before It's Too Late," and "5 Ways CIOs Should Speak Digital to Executives." Dr. Andriole advises Cutter clients across the spectrum of business technology, has been a frequent Cutter author since 1998, and will be presenting the keynote address "Transformation Threesomes" at *Cutter Summit 2021: Winning with Digital Transformation*.

Dr. Andriole is the former Director of the Cybernetics Technology Office of the US Defense Advanced Research Projects Agency (DARPA). He served as CTO and Senior VP of Safeguard Scientifics, Inc., where he was responsible for identifying technology trends, translating that insight into the Safeguard investment strategy, and leveraging trends analyses with Safeguard partners to help them develop business and marketing strategies. Dr. Andriole was also CTO and Senior VP for Technology Strategy at CIGNA Corporation, where he was responsible for enterprise information architecture, computing standards, the technology R&D program, and data security, as well as overall alignment of enterprise information technology investments with CIGNA's multiple lines of business. As an entrepreneur, Dr. Andriole founded International Information Systems (IIS), Inc., which designed interactive systems for a variety of corporate and government clients. He is also cofounder of The Acentio Group, a strategic consulting consortium that identifies and leverages technology trends to help clients optimize their business technology investments. Dr. Andriole is also former Professor of Information Systems and Electrical and Computer Engineering at Drexel University as well as former Professor and Chair of the Department of Information. He can be reached at sandriole@cutter.com.

About Cutter Consortium

Cutter Consortium is a unique, global business technology advisory firm dedicated to helping organizations leverage emerging technologies and the latest business management thinking to achieve competitive advantage and mission success. Through its research, training, executive education, and consulting, Cutter Consortium enables digital transformation.

Cutter Consortium helps clients address the spectrum of challenges technology change brings — from disruption of business models and the sustainable innovation, change management, and leadership a new order demands, to the creation, implementation, and optimization of software and systems that power newly holistic enterprise and business unit strategies.

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