DANIEL BURRUS'

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**TECHNOLOGY
HARD TRENDS
S H A P I N G
2019**

**Burrus
Research®**

1. Artificial Intelligence (AI), Advanced Machine Learning and 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 Gets Bigger and Use of High-Speed Data Analytics Expands

Big Data is a term that describes 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 that enable making rapid, critical decisions. **High-Speed Data Analytics**, using advanced cloud services, will increasingly be used as a complement to existing information management systems and programs to identify actionable insights from the massive Big Data explosion. **Big Data-as-a-Service** will emerge as cloud providers offer midsize and smaller organizations access to much larger streams of relevant data they could not otherwise tap into. Separating good data from bad data will also become a rapidly growing service.

4. Cloud Computing Grows with Advanced Cloud Services

New variations on public, private, hybrid, and personal mobile clouds 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. Companies of all sizes are using the cloud and virtualized services as an enabler to cut costs in IT, human resources, and sales management functions. 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 offered to 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**. All will grow rapidly for small and large companies, with many new players in a multitude of business process categories.

7 Blockchains Grow In Use and Application

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 Start to Grow

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 are looking for. Or, inside a store, use your phone's camera and AR app to quickly locate the products you need. Additionally, conventional-looking glasses will allow wearers to overlay data on their fields of vision, providing useful information about what they're looking at—or, if they prefer, functioning as traditional glasses, by means of a control on the earpiece. 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 Electronic Assistants with Microphone-Enabled Devices

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

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. For example, smart cars will increasingly become aware of situational changes and respond as they get more connected to smart infrastructure such as roads, bridges, and other cars, thanks to embedded and networked sensors combined with other technologies such as **GPS**.

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

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. We will begin to see **Manufacturing as-a-Service** begin as designers use **CAD** software to design products, send them digitally to 3D Printing companies that own industrial-strength, 3D printers, and then ship them to the customers.

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 that is with us 24/7 and signaling a profound shift in global computing. This new level of mobility and connectivity by many millions around the world is increasingly 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 all sizes of organizations as we see mobile data, mobile media, mobile sales, mobile marketing, mobile commerce, mobile finance, mobile payments, mobile health, and many more, explode.

13 Mobile Apps for Business Processes Grow Rapidly

As we increasingly transform business processes using mobility, we will see mobile apps for purchasing, supply chain, logistics, distribution, service, sales, maintenance, and more, 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 Take Off

Mobile banking, using smartphones as eWallets, is already being used in an increasing number of countries and 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 Go Mainstream

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. This will create new opportunities as well as challenges for organizations of all sizes.

16 Social Business Applications Diversify

Social takes on a new level of urgency as organizations shift from an Information Age "informing" model to a Communication Age "communicating and engaging" model. **Social Software** for business will reach a new level of adoption with applications to enhance relationships, collaboration, networking, social validation, and more. **Social Search** and **Social Analytics** will increasingly be used by marketers and researchers to measure real-time sentiment of large groups of targeted people.

17 Visual Communications for Business Increase

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 main relationship-building and communications tool.

18 Enhanced Location Awareness Embraced by Large Retail

Location awareness using in-building systems allows customers with smartphones to navigate stores and find what they are looking for fast. 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. Early enterprise applications include logistics and supply chain to name a few.

19 Drones Go Beyond Fire, Police, Search-and-Rescue 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 Increase In Application and Use

Energy storage starts to become a reality as companies such as Tesla expand the sales of 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**. Looking a little further out, as electric and hybrid cars increase in numbers, they will increasingly be plugged in when not in use for the purposes of charging, storing, and using power.

Daniel Burrus is considered one of the World's Leading Futurists on Global Trends and Innovation. *The New York Times* has referred to him as one of the top three business gurus in the highest demand as a speaker.

He is a strategic advisor to executives from Fortune 500 companies helping them to develop game-changing strategies based on his proven methodologies for capitalizing on technology innovations and their future impact. He is the author of six books, including *The New York Times* and The *Wall Street Journal* best seller Flash Foresight as well as the highly acclaimed Technotrends.
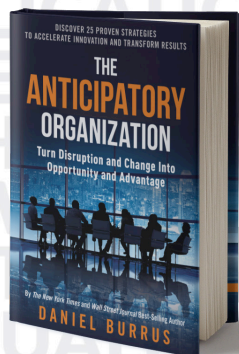
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