41st Annual Technology Trends List

DANIEL BURRUS' TOP 25 TECHNOLOGY HARD TRENDS SHAPING 2024... AND BEYOND

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Embrace Tomorrow's Certainties - A Definitive Guide to the Top 25 Technology Trends Set to Transform Your Future

In 1983, I became the first and only futurist to accurately identify the 20 core technologies that would drive exponential change and value creation for decades to come. The list included A.I., Distributed Computing, Nanotechnology, Genetic Engineering, Lasers, and Fiber optics to name a few.

Since 1983, my commitment to forecasting trends has been unwavering, reflected in seven books and thousands of articles. This accuracy lies in my methodology that distinguishes between Hard Trends (future certainties) and Soft Trends (possibilities).

In a world inundated with trends, the true challenge is discerning which ones will materialize. This Top 25 List serves as a strategic compass, guiding you to wisely place your bets where the future is certain, providing a solid foundation for strategic decision-making.

Exponential Growth Opportunities:

Embedded within this list are trends developed enough to catalyze exponential business growth. Each trend is on a trajectory of exponential expansion, promising significant impacts on both personal and professional facets of our lives.

Game-Changing Opportunities:

Dive into the vast landscape of opportunities these trends unveil across diverse applications and industries. This isn't merely a list; it's a roadmap for those ready to embrace positive disruption and capitalize on transformative possibilities.

Leading Futurist, Strategic Advisor,
Disruptive Innovation Expert

Hard Trends vs. Soft Trends:

Understanding the nuance between Hard Trends and Soft Trends is pivotal. Hard Trends represent certainties shaping our future, while Soft Trends are possibilities. This knowledge empowers you to make informed decisions, minimizing uncertainty in strategic planning.

Become a Positive Disruptor:

As you navigate through these trends, identify specific avenues to leverage their potential. Seize the opportunity to become a positive disruptor within your field, harnessing the transformative power embedded in these certainties for innovation and success.

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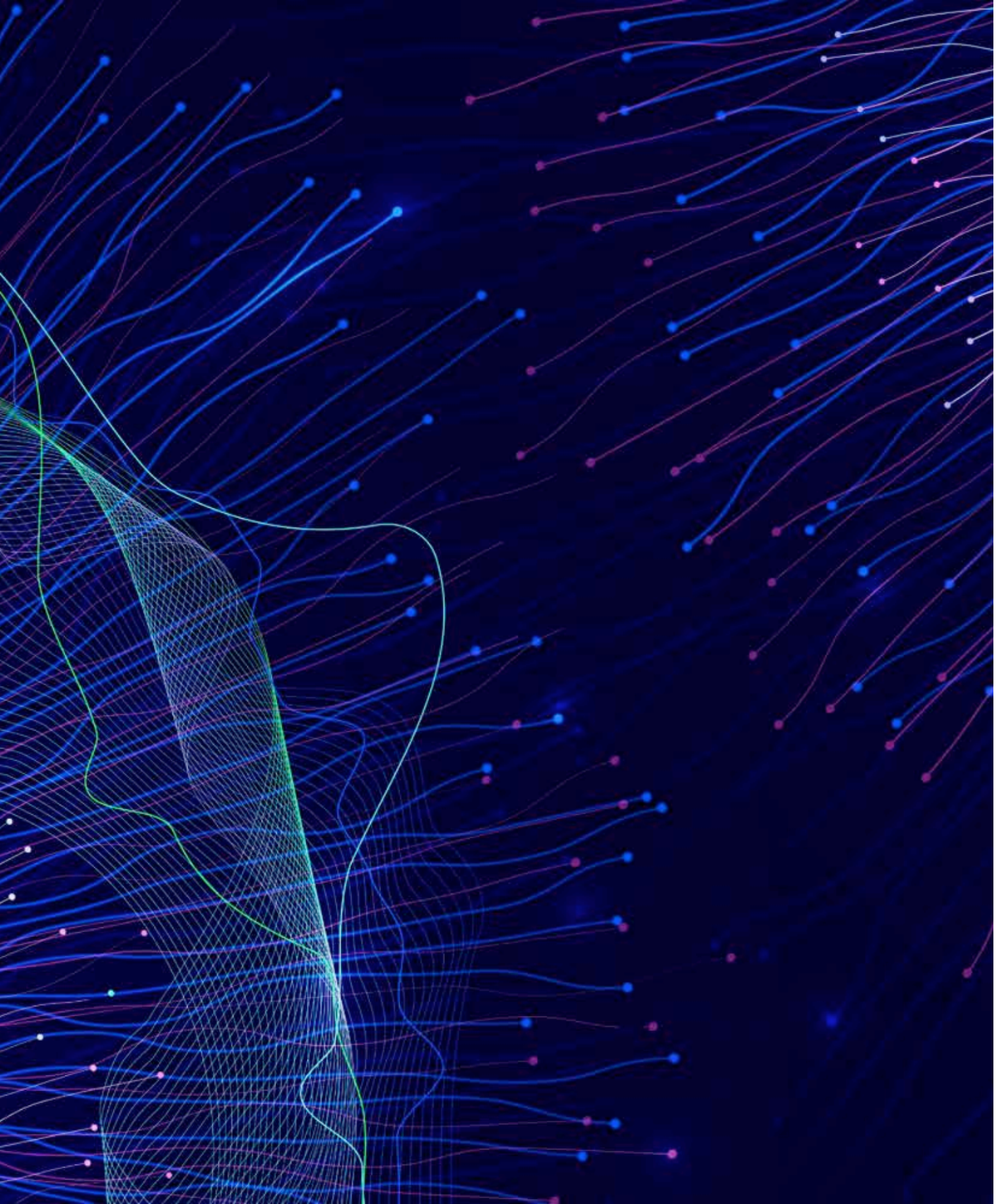

Unlocking **Opportunities** and Driving **Innovation** in Your Industry

Discover the actionable steps to leverage the transformative power of the Top 25 Tech Trends. From strategic planning to accelerated innovation, this guide provides a roadmap for immediate and impactful integration into your business. Start your journey to success today.

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Burrus Top 25 Technology Trends for 2024

1. Generative AIs beyond exponential growth will dramatically accelerate innovation and digital transformation in every industry.
2. AI will increasingly be integrated into all Processes, Products and Services.
3. Rapid advances in AI will drive Augmented Thinking and Augmented Movement to new levels of application.
4. Rapid growth in both Semiautonomous Technology and Fully Autonomous Technology will disrupt and transform numerous industries.
5. Rapid growth of Ultra Intelligent Electronic Agents, Business Bots and Voice-Enabled Interactive Products.
6. The increasing Datafication of Everything will drive the use of AI-Enabled Streaming High-Speed Data Analytics.
7. Advanced Distributed Cloud Computing Platforms and Services, coupled with Generative AI, will provide a new level of digital transformation.
8. Virtualization Surges Across Hardware, Software, Storage, Applications, and Networking.
9. Virtual Reality, Augmented Reality, Digital Twins and the Metaverse will take a Transformative Leap.
10. Increasing use of Social Business Applications, including the VR-enabled Metaverse, and AI-enabled Behavior Analytics and Personality Profiles.
11. Increasing use of Virtualization for Processes and Services enabling Everything as a Service (XaaS).
12. Satellite Mega-Constellations and 5G/6G Wireless Will Propel Swift Expansion of Personal and Business Networking, Spurring Datafication and Democratization of AI.
13. Accelerating Fusion of IoT, Edge Computing, Advanced Cloud Platforms, AI, and 5G Converge Rapidly, Shaping the Internet of Everything (IoE).
14. Escalating Cybersecurity Challenges Will Propel Exponential Growth in Adaptive and Predictive Systems, Enhanced by a Paradigm Shift in Employee Cyber Education.

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Burrus Top 25 Technology Trends for 2024

15. User identification and verification technologies such as Multiple Biometrics, Digital Keys, and Advanced Tokenization will be increasingly applied by organizations and users.

16. Industrial Blockchains Will Gain Momentum Across Sectors, While Cryptocurrency, Digital Currency, and NFTs Drive Web 3 Internet Decentralization Trend to New Heights.

17. Smarter Smartphones and Tablets, Empowered by 5G and AI, Emerge as Intelligent Digital Platforms, Spearheading a Wave of Mobile Innovation and Next-Gen Mobility.

18. Advanced Mobile Apps, Web Apps, and Super Apps, Fueled by 5G Capabilities and Generative AI, Drive an Accelerated Wave of Mobile Application Evolution.

19. Smart Wearables, Propelled by Advanced Sensors, Will Emerge as Personalized Health Monitors and Communication Hubs, Accelerating the Diagnosis of Physical and Mental Well-Being, and Redefining Communication and Collaboration.

20. FinTech, InsurTech, and other AI & Blockchain Disruptions Surge, Accelerating the Transformation and Disruption of Traditional Banking, Insurance, Financial Advising, Accounting, and Beyond.

21. Generative AI, Tele-Education, Remote Instruction, Online Learning, and Gamified Training Propel Swift Advancements in the Landscape of Learning and Development.

22. Advancements in Additive Manufacturing (3D Printing) Shift from Evolution to Revolution, Rapidly Transforming and Reshaping a Diverse Range of Industries.

23. Drones Ascend to New Heights with Integration of AI, 5G, and Microsatellite Networking.

24. Accelerating Growth in Energy Storage, Microgrids, Renewable Technologies, Sustainable Fuels, Green Energy, including Green Hydrogen, and Electric Vehicles Reflects an Unyielding Focus on Environmental Sustainability.

25. Rapid growth of Genomics, Gene Editing with CRISPR, mRNA and Synthetic Biology.

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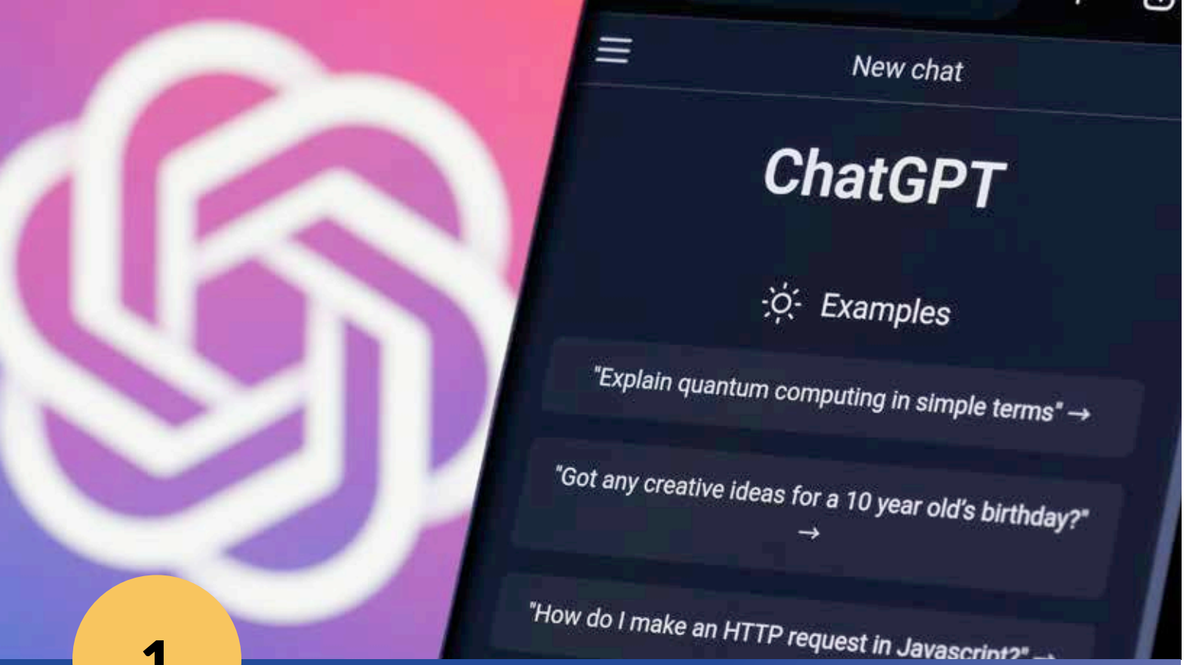

1

The use of Generative AI, Large Language Models (LLM), Opensource AI Models, and thousands of new LLM-enabled AI tools will grow at beyond exponential levels, dramatically accelerating innovation and digital transformation in every industry.

Generative AI's game-changing ability to create new content, such as text delivered in a conversational way, new images, videos, audios, and computer code, to name just a few, will increasingly impact every profession and every industry. Trained on **Large Language Models (LLM)** that use **Machine Learning** algorithms and **Deep Learning** techniques, Generative AI's global use will grow at *beyond* exponential levels dramatically accelerating innovation and digital transformations.

Generative AI's ability to be a first-draft digital assistant will increasingly transform content creation, operations, automation, recruiting, customer service, marketing, and sales, to name a few. Humans will increasingly be replaced by humans using AI, ushering in a new level of productivity and creative problem solving (*See Augmented Thinking)*. AI guidelines and safeguards will be increasingly needed to protect systems and humans from potentially catastrophic AI-enabled problems. By integrating all previous AI technology categories into one, Generative AI will enhance and accelerate the evolution of every technology-driven trend in this report to new transformational levels.

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2

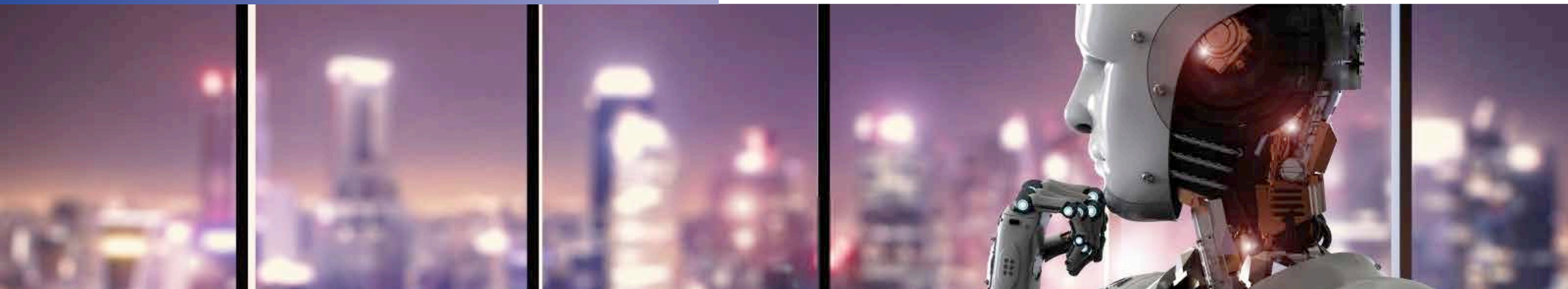
Artificial Intelligence, including Machine Learning, Deep Learning, and Generative AI, will increasingly be integrated into all Processes, Products, and Services.

Artificial intelligence, including **Machine Learning (ML)**, **Deep Learning (DL)**, and **Generative AI**, applications, will increasingly be offered as a service, dramatically lowering the cost and increasing the application to every industry.

AI, ML, Generative AI, robotic process automation, Lo-Code/No-Code and other rapid application tools enable **hyperautomation systems** to identify and automate redundant business processes and much more.

Thanks to **Large Multi-Modal Language Models** and the rapid rise of Generative AI coupled with the as-a-service model, better sensors, and increased machine intelligence with voice communications, **intelligent networked robotics** will increasingly work with humans in new and productive ways.

From **demand forecasting**, and **real-time audits** to **AI-enabled decision-making** and the use of **semiautonomous and fully autonomous vehicles**, humans will increasingly rely on AI.



3

Rapid advances in AI will drive Augmented Technologies, including Augmented Thinking and Augmented Movement, to new levels of application.

Augmented technologies are designed to increase humans' cognitive and physical capabilities. A**ugmented Thinking technologies** will increasingly provide real-time actionable insights and knowledge drawn from AI-enabled data analytics of **large language models** and data sets to enhance human thinking and problem-solving.

Humans and AI will increasingly have a symbiotic relationship in which one needs the other for peak performance. **Augmented Movement technologies** enhance physical human functionality. A hearing aid is an example of **sensory augmentation**, an artificial leg is an **appendage augmentation**, and a **powered exoskeleton** worn by a 95-pound nurse in Japan so that she can lift a 200-pound patient into a bed is a **functional augmentation**.

GM workers wear powered **exoskeletons** to lessen arm, hand and joint problems while assembling cars. All of our physical parts and systems, including our genes, can be augmented.

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4

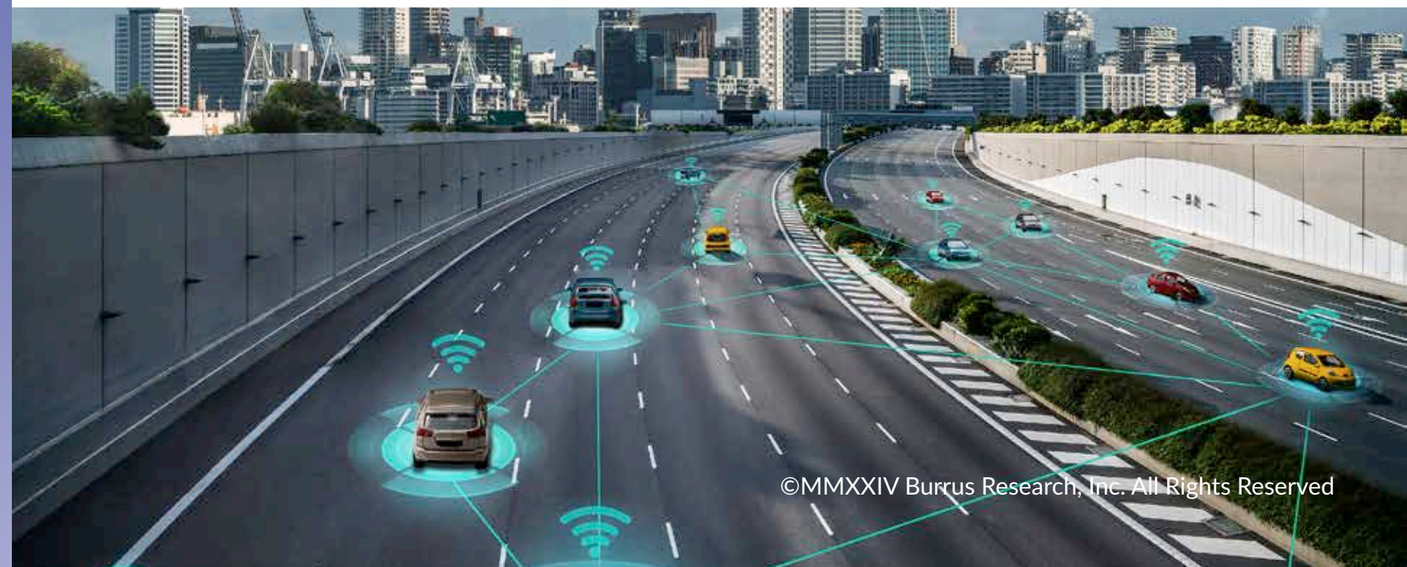
Rapid growth in the application of both Semiautonomous Technology and Fully Autonomous Technology will both disrupt and transform numerous industries.

Autonomous technologies use AI and a host of networked motors, actuators, and sensors to automate functions like driving a car, piloting a ship, flying an aircraft, driving a harvester or operating a forklift, to name only a few.

Semiautonomous technologies blend human input with selected autonomous functionality that has predetermined parameters that allow autonomous functions to take control when needed.

For example, a human driving a semiautonomous vehicle can control the vehicle, but autonomous functionality will take over to avoid potential accidents as needed.

The use of both semiautonomous and fully autonomous technologies goes way beyond vehicles, but that is where most of the investment will continue to flow in the next several years.



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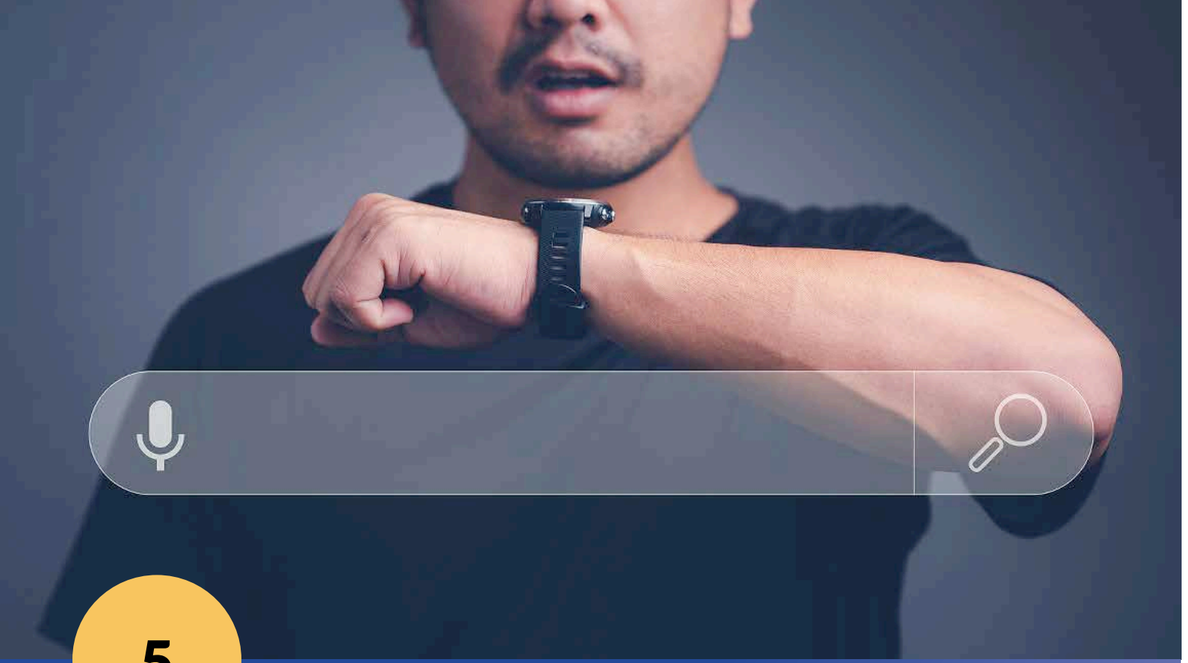

5

Advances in Generative AI and wireless broadband are accelerating the application of Ultra Intelligent Electronic Agents that will include Voice Commerce, Voice Search, Intelligent Business Bots, and Voice-Enabled Interactive Products.

Thanks to the rapid rise of **Generative AI** such as **ChatGPT** and others, there is an increasing use of both audio and/or video smart e-assistants and chatbots that are rapidly becoming a **mobile electronic concierge** available on any smart device, including phones, wearables, tablets, televisions, and cars, to name a few.

Traditional standalone audio assistants, including Amazon, Google, Apple, and others, are being reinvented using **Generative AI** turning them into powerful **Business Bots** for business, and **Government Bots** for governmental applications.

Retailers will increasingly have an AI-enabled **Virtual Sales Assistant**, and we will be increasingly using an **e-Personal Health Assistant** that taps into the real-time health data from a smart wearable such as a smart watch to predict potential problems and offer suggestions. From the **AI-enabled Virtual Help Desk** to sales, marketing, and accounting, to services such as investment advice, adding AI-enabled voice instructions and advice to any product or service will exponentially accelerate.

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6

The increasing Datafication of Everything creating even bigger Big Data will increasingly drive the use of AI-Enabled, Streaming High-Speed Data Analytics.

Big data is a term that describes the technologies and techniques used to capture and utilize exponentially increasing streams of data. **Edge computing** and **IoT** adding **networked intelligence** to an increasing number of “things” will exponentially increase the amount of data created.

The goal is to bring enterprise-wide visibility and insights to users that enable making rapid, critical decisions at the speed of need. Using **advanced cloud services** and **AI-enabled streaming high-speed data analytics** will increasingly be employed as a must-have complement to existing information management systems and programs to identify actionable insights from a growing mass of big data.

Real-time data audit services that separate good data from bad data and irrelevant data will also become a rapidly growing service. Enterprise level Generative AI systems will both elevate and accelerate this trend.

7

Rapid adoption of Advanced Distributed Cloud Computing Platforms and Services, coupled with Generative AI applications, will provide the backbone for a new level of digital transformation.

Businesses of all sizes will increasingly embrace new variations in **public**, **private**, **hybrid**, **industrial**, and **personal mobile clouds**.

In addition, **distributing cloud services** to different locations with centralized cloud governance will provide many new applications.

The shift in how organizations obtain and maintain software, hardware, and computing capacity to cut costs in IT has been dramatically accelerated and will continue to transform all processes including human resources and sales management.

Beyond cost cutting, new cloud computing platforms and services will increasingly be used to create new products, services, and markets.

Industry cloud platforms bundle cloud capabilities serving specific industries. Not all clouds are created equal. Some are optimized for IoT and edge applications while others are designed for different levels of security and speed.

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8

Increasing use of Virtualization of Hardware and Software, including Storage, Applications, and Networking.

The virtualization of software and hardware has been increasingly used by both large and small businesses as virtualization security improved.

Hardware as a Service (HaaS) has increasingly joined **Software as a Service (SaaS)**, creating what some have called "**IT as a Service**." In addition to the rapid growth of **virtual storage** and **virtualization of processing power**, and the **virtualization of AI-enabled services** will continue to grow rapidly, allowing mobile devices to access supercomputer capabilities and apply them to processes such as purchasing and logistics.

These services will help companies cut costs and accelerate innovation, 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.

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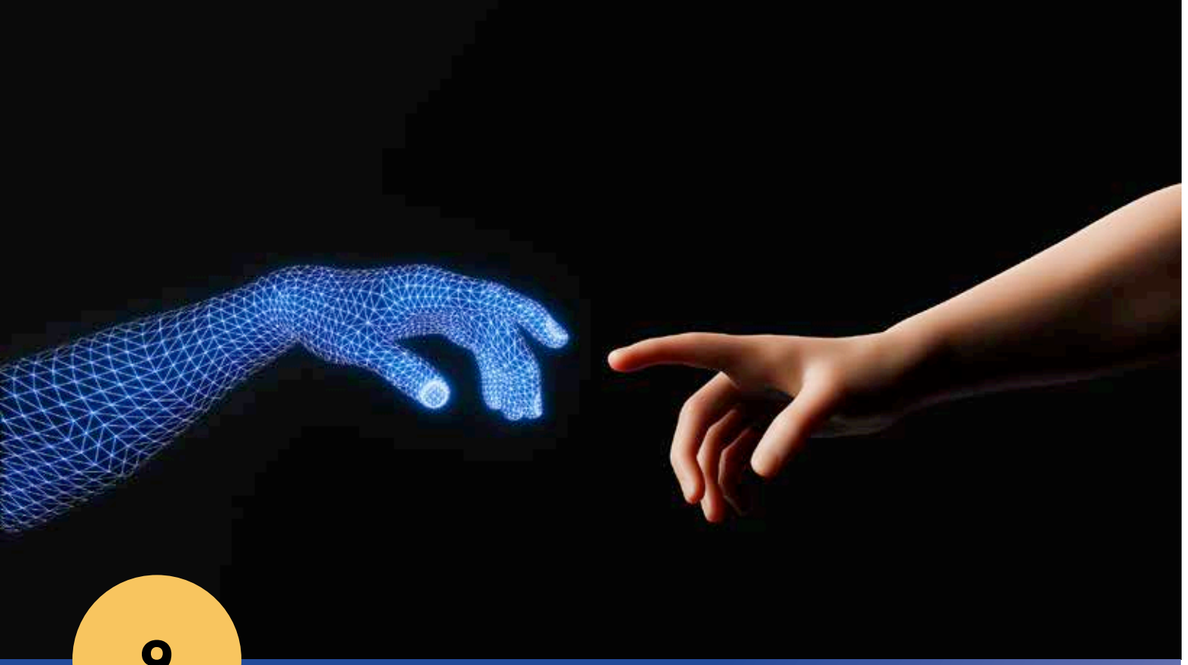

9

Virtual Reality (VR), including the Metaverse, Augmented Reality (AR) Applications, and Digital Twins, will shift from a rapid evolution to a revolutionary level of applications.

Augmented reality allows users to point a digital camera at something using a smartphone or AR glasses and overlay just-in-time information about the subject they are focusing on.

Soon, we will see companies selling conventional-looking AR glasses that allow wearers to overlay data on their fields of vision, providing useful information about what they're looking at. Business applications for AR glasses will grow rapidly.

By contrast, **Virtual Reality** uses oversized headsets to shut out the real world and provide an immersive, computer-generated 3D environment with which the wearer can interact. Thanks to new relatively low-cost hardware, new commercial applications for specific industries are rapidly growing.

AR and VR have already shifted from a single user to a multiuser social experience referred to as the **Metaverse**, which will drive accelerated growth for both business and gamers in the near future.

Digital Twins will be increasingly used to simulate and test anything before they are built or implemented, from new drugs, to new buildings, to new products, processes, and services.

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10

Increasing use of Social Business Applications, including the VR-enabled Metaverse, and AI-enabled Behavior Analytics and Personality Profiles.

Social software for business will reach a new level of adoption, with applications to enhance relationships, collaboration, networking, social validation, and more. **AI** and **VR** with a social **Metaverse** focus will increasingly play a role to grow engagement.

Marketers and researchers will employ **social search** and **social analytics** to measure real-time sentiment of large groups of targeted people.

Social media platforms such as Facebook and others are increasingly using **AI** and **user engagement data** to create **behavior analytics** and **personality profiles** for each user. By identifying an individual user's emotional hot buttons, marketers will increasingly know which buttons to push to get the desired behavior.

This, combined with the growing use of **Generative AI**, has created an unexpected consequence, shifting us from the Information Age to the Disinformation Age.

In addition, a growing global crisis of trust is accelerating due to the increasing use of **Deep Fakes** and other AI-enabled technologies that are spreading a new level of disinformation, elevating fear to anger to hate. Note that this represents a Soft Trend that can be changed.

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11

Increasing use of Virtualization for Processes and Services enabling Everything as a Service (XaaS).

Advances in cloud platforms, AI, 5G/6G cellular, and others listed in this report, will dramatically accelerate the **virtualization of processes and services** by organizations of all sizes needing to update and streamline existing services and to rapidly deploy new and often disruptive services.

This will lead to a more **Distributed Enterprise Model** accelerating innovation and digital transformation and driving growth far beyond national borders.

Anything can become a virtual service offering, and this trend is just now starting to explode. For example, the rapid growth of **Videoconferencing as a Service**, **AI as a Service**, **Blockchain as a Service**, **Quantum as a Service**, **Collaboration as a Service**, **Security as a Service**, **Networking as a Service**, and **HR as a Service**, are a few examples.

Traditional products such as cars, trucks, RVs, boats, motorcycles, you name it, will increasingly use a subscription service model.

12

Increasing speed and availability of wireless broadband enabled by Satellite Mega-Constellations and 5G/6G Wireless will dramatically expand personal and business networking on a global level as well as drive the datafication of everything and the democratization of AI.

Satellite mega constellations, such as OneWeb and Starlink, consist of thousands of mass-produced small satellites operating in low Earth orbit combined with a network of ground receivers designed to provide internet service to anywhere on the planet.

By providing global broadband access, businesses large and small will have access to a vastly expanded global workforce and customer base. **5G** advantages are already enabling the creation of new multibillion-dollar businesses.

There are several variations of 5G, including high speed and low latency, and 5G can be deployed with a public and/or private network.

Wireless value integration, combining several wireless systems to elevate value creation throughout an organization, its ecosystem, and customers, is already finding new applications to accelerate innovation and growth. 6G cellular is advancing and in the R&D pipeline headed our way.

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13

Rapid convergence of the Internet of Things (IoT) combined with Edge Computing, Advanced Cloud Platforms, AI, and 5G will accelerate, forming the Internet of Everything (IoE).

Machine-to-Machine (M2M) communications using chips, microsensors, and both wired and wireless networks will join networked sensors to create a rapidly growing IoT ecosystem.

Industrial IoT (IIoT) networks sharing real-time data, performing diagnostics, and making virtual repairs, all without human intervention, will grow rapidly. There are well over 90 billion “things” talking to each other, performing tasks, and making decisions based on predefined guidelines using AI.

With our homes, businesses, parking meters, bridges, and even our bodies through wearables, all getting connected, the rapid growth of IoT brings us to the **Internet of Everything (IoE)**. Not all generated data needs to come back to the mother ship to create high value.

Edge computing will increasingly be used to tame the massive amounts of data IoT and IoE will create by bringing instant insights and actions to the point of use and at the speed of need.

As AI increasingly becomes embedded at the chip level, the power and speed of edge computing will dramatically increase.

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14

Cybersecurity problems will increase, driving the exponential growth of Adaptive and Predictive Cybersecurity Systems coupled with a new level of employee cyber education.

Business, government, and education at all levels have recently moved cybersecurity from an underfunded back-office activity to a major initiative going forward.

With the rapid growth of connected technologies, such as an increasing use of product and service **virtualization**, **edge computing**, the **Internet of Things** (IoT), **AI**, **ML**, **Generative AI**, and **semiautonomous and fully autonomous vehicles**, to name a few, security systems will move beyond reacting faster after a cyberattack occurs and will include **adaptive and anticipatory security systems using AI** and other advanced tools, such as **behavioral analytics** and **network intelligence**.

This will add a level of **Predict and Prevent**, allowing us to stop many, but sadly not all, attacks before they start. Looking ahead, emerging **Quantum Computing hardware and software applications**, combined with **Generative AI**, represent both a major threat and opportunity when it comes to encryption and everything else.

Quantum computing is already being offered as a service by Amazon and a few others, creating yet another platform for advanced innovation.

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15

User identification and verification technologies, such as Multiple Biometrics, Digital Keys, and Advanced Tokenization, will be increasingly applied by organizations and users.

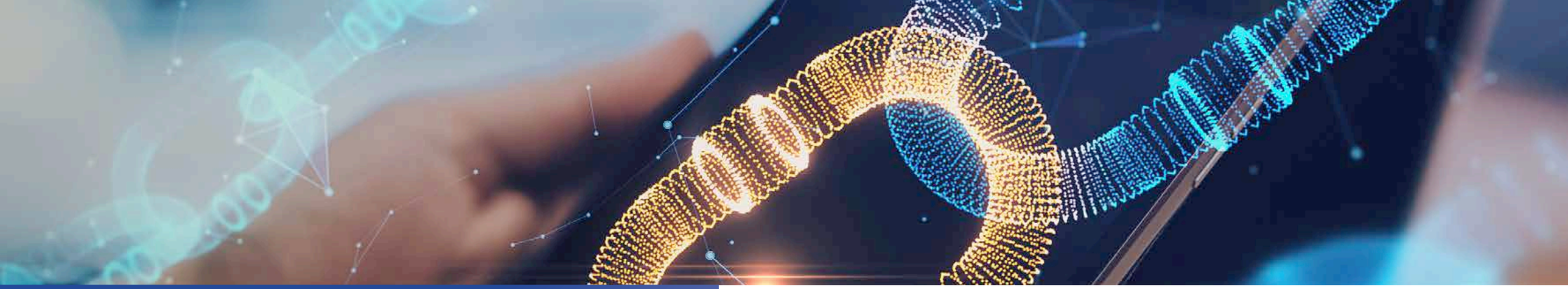
Next-gen biometrics and advanced tokenization will increasingly be integrated into all digital devices including computers, smartphones, tablets, wearables, and other identity management and security devices.

Two-factor authorization and first-gen **biometrics** using finger, facial, and voice recognition for identification have helped, and biometrics will expand into multiple biometrics depending on the level of security needed.

New biometrics include adding heartbeat patterns, blood vessel patterns under the skin, and much more enabled by new security-featured wearables.

As mentioned above, the combination of **AI** and **Quantum computing** will play a major future role in identity management.

Different levels of security will require different combinations of biometrics, tokenization, and AI assistance.



16

The application of new Industrial Blockchains will dramatically accelerate in a wide variety of industries, and, at the same time, Cryptocurrency, Digital Currency, and NFTs will continue their growth, all accelerating the Web 3 Internet decentralization trend.

Introduced as a means of transferring bitcoins, blockchains and related **distributed ledger technologies (DLT)** are increasingly being used in any number of key areas.

A system that enables secure, digital direct transfers, blockchains decentralize transactions by eliminating the middleman, thereby allowing for direct connection among all involved parties.

Blockchain technology goes far beyond cryptocurrency applications to processes such as the transfer of contracts, insurance policies, real estate titles, bonds, votes, and other items of value.

Blockchains provide increased transparency and, as a result, distributed trust. They will increasingly be applied to low-transparency, high-cost industries, such as the U.S. healthcare market.

Bitcoin and other **cryptocurrencies** continued to grow as a hedge as well as an investment even though they remain volatile. **Digital currency** is being tested and, in a few cases, implemented by an ever-increasing number of countries. Blockchain also enables **Non-Fungible Tokens** (NFTs) with applications growing in art and music, as well as being applied to certifications, copyrights, and trademarks, to name a few.

17

Mobile Hardware such as Smarter Smartphones and Tablets connected by 5G and enabled with AI will increasingly be used as intelligent digital platforms for mobile innovation.

Most mobile phones sold globally have browsers and also have access to **on-demand virtual services**, making a smartphone our primary AI-enabled multimedia computer.

As AI is increasingly integrated into the chips in our devices, and 5G networks become the norm, the capabilities of our mobile devices will increase dramatically.

This will increasingly create a profound shift in global computing, 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 integrates virtualization – **Anything as a Service (XaaS)** and other technologies in this report – will find unlimited ways to accelerate innovation and growth.

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18

Mobile Software, such as the use of advanced Mobile Apps, Web Apps, and Super Apps enabled by 5G capabilities and Generative AI, will accelerate mobile application innovation.

As we increasingly transform business processes using mobility, the use of **mobile applications** for purchasing, supply chain, logistics, distribution, service, sales, and maintenance, to name a few, will continue to grow rapidly.

There will be an increasing focus on **multimedia**, **AR,** and **VR business applications**, giving companies a competitive advantage and giving users access to the personalized information they need on their mobile devices anytime and anywhere.

A rising category of **Super Apps** combines features and functions of an app with a large platform to widen its use, tied to an ecosystem allowing third parties to add functionality for their specific users.

The low latency and higher speed capabilities of 5G will continue to bring a host of transformative business applications.

In the next few years, we will see new billion-dollar businesses enabled by new smart mobile capabilities.

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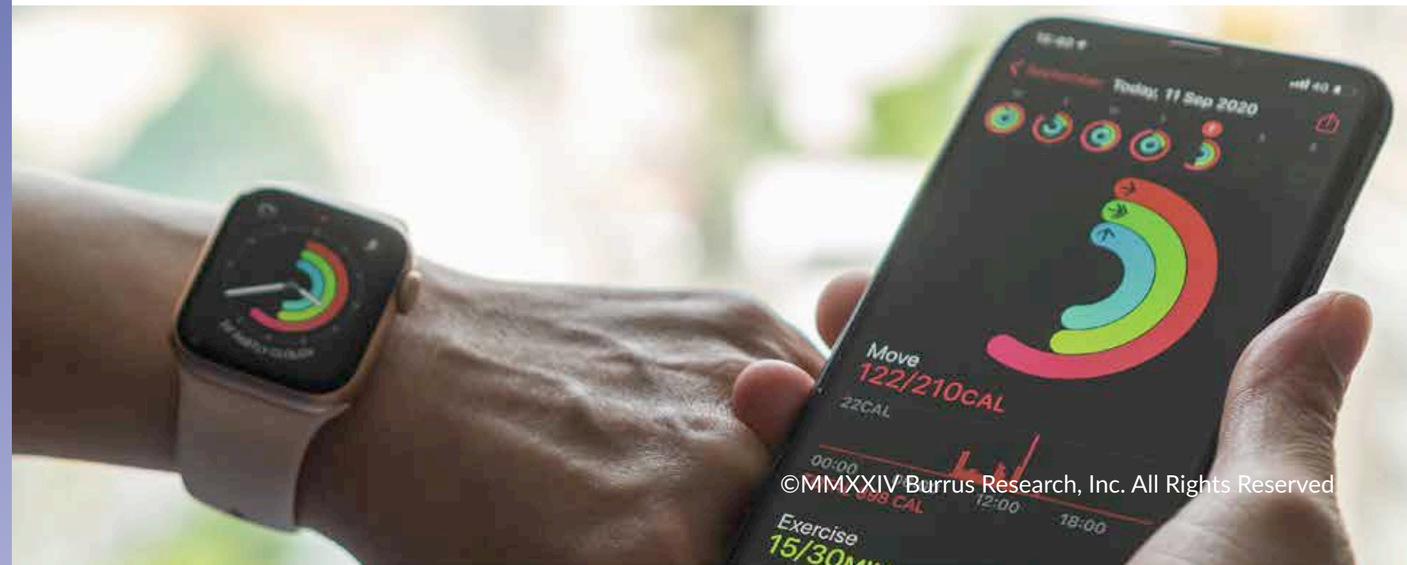
19

Accelerating use of Smart Wearables driven by a growing list of Advanced Sensors will increasingly provide a personalized way to monitor and diagnose physical and mental problems, as well as offer new levels of communication and collaboration capabilities.

Wearables will increasingly be used for both personal and business applications as 5G and other technologies in this report converge to create new value streams and accelerated growth.

Apple, with its smart watch fitted with an increasing number of health sensors and software, joins Google, Samsung, and others in an intensifying battle for market share. An ever-expanding array of new sensors coupled with intelligent software and applications will drive further innovation and sales in other wearable technology.

An increasing use of **Smart Patches** that can be attached to the skin for remote disease management, diagnostics, and general health information via wireless transfer will expand the definition of wearables.



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20

Rapid growth of FinTech, InsurTech, and other AI- and Blockchain-enabled industry disruptions will accelerate and increasingly disrupt traditional banking, insurance, financial advising, accounting, and other industries.

AI, Decentralized Finance (DeFi) using **Blockchain**, and **advanced automation** will be used by **FinTech** companies to increasingly disrupt traditional banking.

Using similar technologies, **InsurTech** companies will increasingly disrupt traditional insurance companies, just as a growing number of new companies will focus on disrupting other industry segments such as financial advisory services, accounting, and auditing, to name a few.

A number of the exponentially growing technology Hard Trends in this report, including **Generative AI**, **Augmented Thinking**, **Blockchain**, **AR**, **Hybrid Cloud**, and **Virtualized Services**, to name a few, will force many traditional players to learn and adopt new technology-enabled business models by combining an enhanced virtual customer experience with an enhanced local presence, providing both a redefined in-person and virtual customer experience that leverages high-touch, high-value human relationships that digital-only services cannot provide.

Traditional players who fail to do so will increasingly struggle, losing both relevance and market share.

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21

The adoption of Generative AI, Tele-Education, Remote Instruction, Online Learning, and the Gamification of Training and Education will advance rapidly.

Generative AI such as **ChatGPT** will be increasingly used to enhance critical thinking skills and applied creativity, with guidelines, by students and teachers at all levels.

In addition, taking classes online has been dramatically accelerated on a global basis the past few years. **Blended learning**, which uses a combination of online and in-classroom instruction, together with **instructional chatbots enabled by AI**, **AR,** and **VR** tools, will increasingly be used to give students an immersive experience as the need for retraining and reskilling continues to grow.

Education and training will increasingly focus on **accelerating learning** by using **AI tutors**, **advanced simulations**, and **skill-based learning systems** that are **self-diagnostic**, **interactive**, **game-like,** and **competitive**. By making the experience fun, engaging, and personalized, learning will improve, and the use of **gamification** will spread.

Massive open online courses (MOOC) have already been embraced by highly recognized and traditional educational institutions, putting them in a position to make location and tuition far less of a barrier to receiving the information, training, and knowledge people need in order to succeed in a rapidly changing world.

Adding new competency and skill certifications will be increasingly important to employees and employers in a rapidly changing world.

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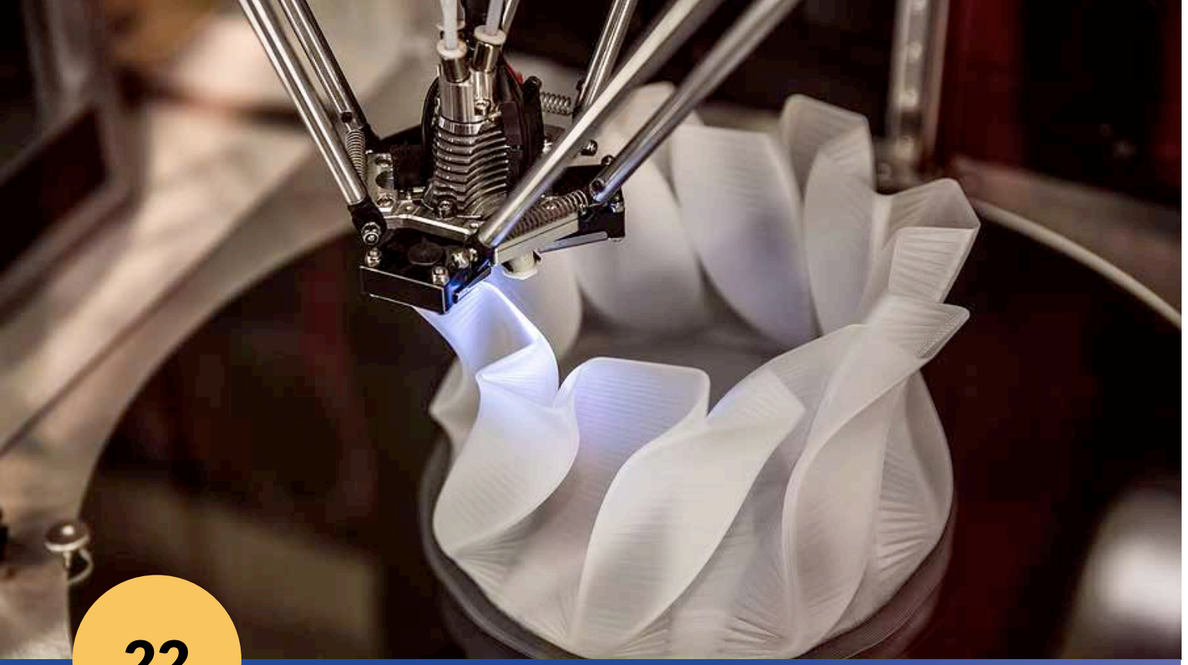

22

Advances in 3D Printing (Additive Manufacturing) is moving from rapid evolution to revolution, and it is rapidly being applied to an ever-expanding number of industries.

Both **customized and personalized manufacturing** of finished goods using **3D printing** have been growing exponentially and, thanks to recent global supply chain disruptions, have been accelerated to a new level.

3D printers build things by depositing material, typically plastic or metal, layer by layer, until the product is finished. Originally designed to print prototypes, 3D printers are increasingly being used to print final products, such as jewelry, iPhone cases, shoes, car dashboards, parts for jet engines, buildings, bridges, rockets, prosthetic limbs, human jaw bones, blood vessels, organs, and much more.

3D printing allows companies to manufacture one-of-a-kind or small runs of items quickly, locally and with far fewer costs. **3D printing as a Service** will increasingly be offered by companies such as Amazon and FedEx, which will print (manufacture) and ship any CAD design from anywhere to anywhere.

And if they don’t do it, others will.

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23

Drones Reach a New Height, Adding AI, 5G, and Microsatellite networking.

The number of applications for drones will continue to expand rapidly. **Drones** have already proven to be of high value from **military applications**, including search-and-rescue and medical supply delivery, and the list of applications will grow rapidly as they are applied to an increasing number of industries.

Drones can be as large as the largest aircraft and ships and as small as an insect. Expanding applications include **agriculture** to check crops, fences, and cattle; utility companies use them to look for downed power lines; and r**eal estate agents** use them for aerial photography.

The explosion of hobby drones will continue to drive innovation for both personal and industrial applications. The use of military drones in the form of planes, ships tanks, and much more will continue to expand in size and capability.

AI, **5G/6G**, **microsatellites** and other technologies in this report will be increasingly integrated, expanding capabilities far beyond today's applications.

24

Increasing focus on Sustainability using Energy Storage, Microgrids, Renewable Energy Technologies, Sustainable Fuels, Green Energy, including Green Hydrogen, and Electric Vehicles will continue to rapidly grow.

Energy storage will increasingly play a key role in driving the widespread use of **green energy production,** such as wind and solar. Companies such as Tesla are selling their smart battery systems (SBS) to businesses and homes that generate some of their own power using solar, wind, or other systems.

The rapid growth of **energy storage systems** and the growing number of **electric vehicles** that can plug into and power a home will enable national networks of smaller and more secure **smart microgrids**.

In addition, as first-generation **hybrid and electric 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.

Green hydrogen produced from renewables instead of sources such as natural gas will rapidly increase.

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25

Rapid growth of Genomics, Gene Editing with CRISPR, mRNA, and Synthetic Biology.

Synthetic biology is a rapidly growing field that combines biotechnology, genetic engineering, molecular engineering and computer science, to name a few, that can be used for designing and building engineered biological systems.

Applications include processing information, fabricating materials and structures, producing energy, manipulating chemicals and even producing food. **CRISPR** is a revolutionary gene-editing technology that can be used to create human cellular models of disease and genetically modified organisms to mimic disease and correct genetic mutations, and more.

Advances in AI and other technologies on this list have accelerated gene editing, whole genome printing, and synthetic biology, creating a new biology-driven revolution with amazing growth potential.

mRNA technology, used to create successful COVID vaccines in record time, will increasingly be used as a new tool to fight current as well as future diseases.

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Turn Disruption Into Opportunity and Advantage

1

Identify the Hard Trends and Related Opportunities

- Identify the Hard Trends that will impact your business and/or customers over the next five years.
- What are the related opportunities?

2

Focus on Transforming Processes

- How will you transform your products, services, or processes over the next five years?
- How will you transform your career over the next five years?
- Based on the Hard Trends, what skills will you need to learn to stay reievant?

3

Redefine and Reinvent Products and Services

- What products or services are ripe for reinvention?
- What would take the least amount of time and/or money to redefine or reinvent?

4

Refine

- Refine your list of top strategic actions to only a few “must do” actions.

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What criteria does Daniel Burrus use to determine the Top 25 Technology-Driven Hard Trends for his annual report?

Daniel Burrus leads the company with a philosophy of helping clients understand and profit from the driving forces of technology-driven change, enabling them to gain new competitive advantage as they create new products, markets, services and careers.

His approach demystifies technological change, brings a new level of certainty to an uncertain world, and helps individuals and organizations discover profitable new uses for new technological tools, creating a shift from a tactical mindset to an anticipatory, strategic methodology.

Today, as founder and CEO of Burrus Research, a research and consulting firm that monitors global advancements and innovation in technology driven trends, Daniel helps clients profit from technological, social and business forces that are converging.

Daniel has been writing about each one of these technology trends for many years, but for one to make it on his Top 25 list, it has to be developed enough so it can be applied to exponentially grow your business. Each technology is growing at an increasingly exponential rate. As such, they will all impact our lives, both personally and professionally, in the coming year and beyond.

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Turning Technological Change Into Competitive Advantage

Over the past four decades, Daniel Burrus, Leading Futurist, Strategic Advisor, and Disruptive Innovation Expert has established a worldwide reputation for accurately predicting the future of technological change and its impact on the world of business. He has helped hundreds of clients identify new opportunities and develop successful competitive business strategies based on the creative application of leading-edge technologies. As an innovative and impactful keynote speaker, Daniel will bring this expertise to your audience, blending timely and provocative knowledge with just the right amount of humor and motivation for presentations filled with information you can take away and use immediately to gain a competitive advantage.

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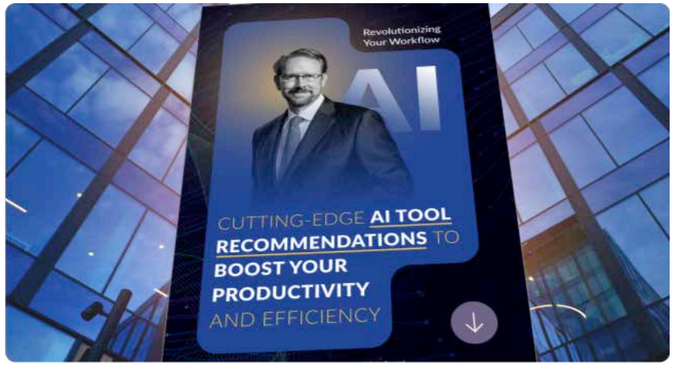

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He changes how his clients think about the future, planning, innovation, disruption, and, most importantly, what is possible.

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

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He has established a worldwide reputation for his exceptional record of predicting the future of technology driven change and its direct impact on the business world. As a business strategist, he has helped hundreds of clients profit from new opportunities and develop successful competitive business strategies based on the creative application of leading-edge technologies.

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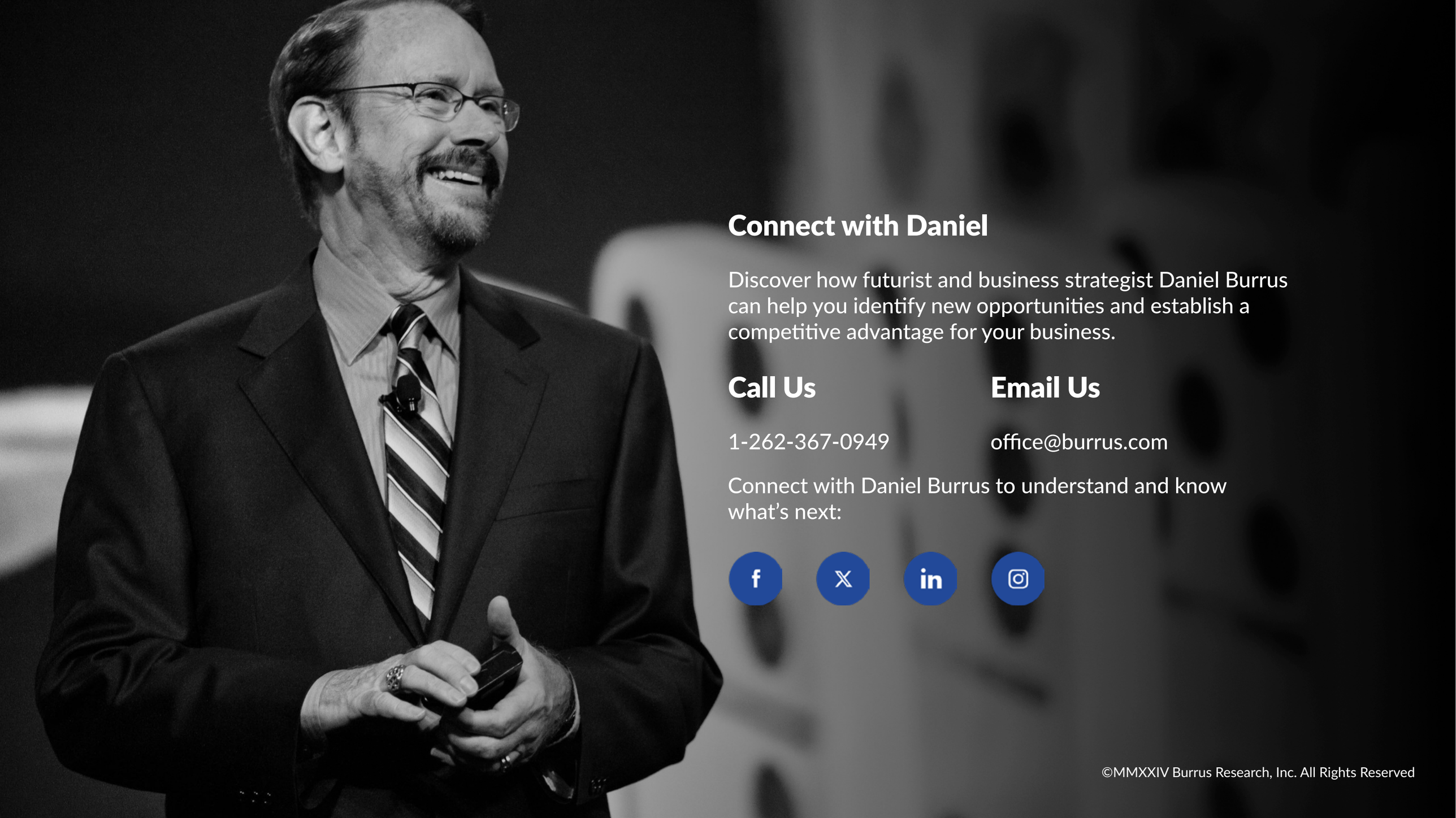

Connect with Daniel

Discover how futurist and business strategist Daniel Burrus can help you identify new opportunities and establish a competitive advantage for your business.

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