MOMENTA

DIGITAL DELIVERED™

PREDICTION REPORT

2021
A Look Ahead

Learn how evolving technologies will impact our life, transform how we communicate, collaborate and do business. Learn how to capitalize on these dynamics to gain a competitive edge for 2021 and beyond.

Summary

Each year we look back, take stock of the present and look ahead at the technologies and trends likely to impact the way we work, the way businesses operate and the most exciting innovations ahead of us. As we look into the new decade, there are advances in technologies that enable powerful new innovations, changes in how we work and create, and changes in how we power growth and move about.

In this report we explore **“Foundational Technologies”, “How We Work”** and **“Where We Are Going”**. This report will provide a detailed 2021 outlook, exploring the implications of these critical trends in a broader context.

Content

SECTION 1

Foundational Technologies – Building Blocks of the future

We first look at five Foundational Technologies which we categorize as Building Blocks of the future. These technologies include:

Artificial Intelligence and Machine Learning Everywhere

Perhaps the most impactful technology trend is the rapid adoption of AI technologies, which have become fully mainstream. Early in 2020 an Oxford Economics and NTT DATA survey of 1,000 business leaders found that adoption of AI was accelerating.

> The survey found that 96% of organizations were at least researching AI solutions, and more than 70% had piloted or fully implemented the technology. According to Statista, the AI software market is forecast to growth at a 54% CAGR to $22.6 billion.

Some of the key innovations in AI include new methods and algorithms that build and open the breakthroughs in Deep Learning. Geoffrey Hinton, VP and Engineering Fellow at Google expects that deep learning will continue to advance with new methods, such as transformers for natural language processing. Current methods look for sequential relationships such as word embeddings or relationships suggested by syntax or grammar to capture their meaning, while transformers parse for vectors of multi-faceted relationships.

Genetic algorithms are gaining prominence for uses in complex systems such as 5G networks. In the past, military have used genetic algorithms to determine flight paths for drones flying thousands of miles to hit their targets. Genetic algorithms help 5G carriers find the best possible route for network traffic that is most efficient with bandwidth. Generative Adversarial Networks use AI to create iterative improvements in videos and images and can automatically enhance 3D imagery.

Nearly every industry is finding new ways to incorporate AI into applications and business processes, and 2021 is likely to show even more progress.

Connecting the Internet of Everything

IoT adoption continues to move along apace, even with the challenges of the global pandemic.

IDC estimates Worldwide IoT spending to return to double-digit growth rates from $742 billion and 8.4% growth in 2020 to achieve a CAGR of 11.3% through 2024.

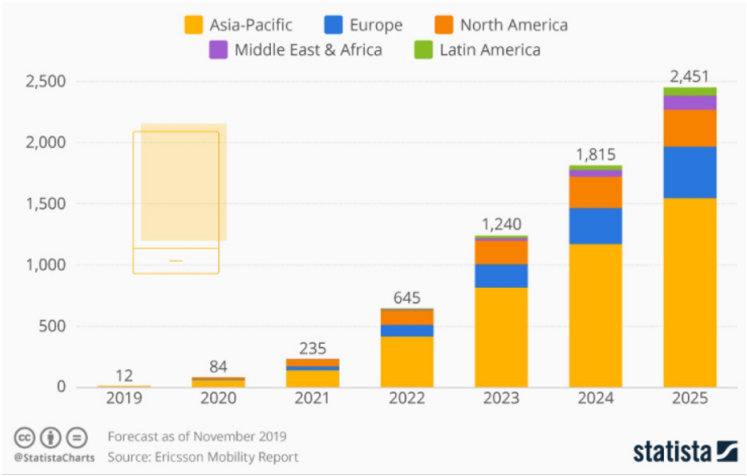
The use cases that will see the fastest spending growth in 2020 include electric vehicle charging, bedside telemetry, and remote health monitoring along with smart home.

The continuing price declines in sensors, semiconductors, storage and connectivity, coupled with emerging low power communications standards such as LoRaWAN enable new uses cases and applications to be implemented at lower cost. Expect to see rapid innovations in both consumer, commercial and industrial applications, driving down costs, improving efficiencies and minimizing risk.

5G – Moving Data Bigger and Faster than Ever

While 2020 saw billions of dollars in infrastructure investment in 5G networks across the globe, 2021 is when we are likely to see adoption occur in earnest.

Global 5G Adoption to Take Off in 2021



With the launch of Apple's iPhone 12 and a number of 5G-compatible Android phones on the market, adoption is expected to skyrocket over the next few years, with global subscriptions forecast to increase from 235 million in 2021 to 2.4 billion by 2025 according to Statista/ Ericsson.

Expect to see rapid activity in trials and POCs of more advanced 5G services such as gaming, virtual reality (VR), and automated applications (robotics, vehicles). One of the most significant use cases will be the ability for businesses to deploy Mobile Edge Computing devices as part of broader applications.

Critical Infrastructure - Cloud Computing

With the rapid transition to distributed workforce, adoption of cloud computing has been essential to support collaboration, communications and other essential business functions. According to the Cloud Industry Forum's research, cloud computing has delivered results for over 90% of organizations during the past year, even when dealing with challenges of COVID.

Additionally, CIF also found that digital transformation across a majority of enterprises sped up by 69% – with 91% of decision-makers indicating that cloud formed an important part of this transformation, and 40% describing the role of the cloud as crucial. 88% of organizations expect cloud service adoption to increase in the next 12 months.

According to 451 Research, enterprises expect workloads primarily executed in cloud-based external environments to increase from 36% in 2020 to 63% in 2022. Additionally, the trend toward multi-cloud adoption will accelerate in 2021, as business use a growing range of cloud services.

Blockchain Maturing in 2021

With Bitcoin experiencing a resurgence of interest at the end of 2020, and with the price over $40,000 for the first time, the underlying technology of blockchain for enterprises is also coming into view. Decentralized finance become one of most prominent crypto trends, laying the groundwork for “enterprise DeFi,” which is predicted to transform financial services operations.

We are seeing developments span different use cases. In March 2020, The World Health Organization launched a blockchain platform designed to detect COVID-19 carriers and hot spots by tracking and tracing users’ health data.

Healthcare, transportation, and logistics are just a few of the areas that may benefit from wider blockchain adoption and implementation. Ernst & Young Canada has publicized a use case with the nonprofit organization Canadian Blood Services to tokenize blood donations. Deloitte’s 2020 Blockchain Trends report found that initiatives utilizing blockchain in clinical trials and pharmaceutical supply chains have been underway. While few are in production, it’s expected there will be a wave of solutions that will go live once regulatory concerns gain clarity.

SECTION 2

How We Work

We then explore the changes and trends affecting “How We Work”. During the pandemic, we saw enormous changes in work – location of employees, adoption of automation, and rising emphasis on wellness and corporate responsibility. We expect that these changes will persist and define the nature of work over the next decade and beyond.

The Rise of Distributed Work

The end of the pandemic is in sight, there is still some time before vaccinations are widespread enough for employees and business to feel comfortable with workers returning to the office. At the beginning of 2021 many companies are still figuring out their remote work plans for the foreseeable future. While some will undoubtedly go back to the office when its safe, many companies have made the commitments to long-term remote work.

> According to a study by PWC, 72% of workers surveyed indicated the preference to keep working remotely at least two days a week.

Major tech companies like Twitter, Shopify, Square, and Slack have announced that their employees can work from home indefinitely if they choose.

The future of work will look different from pre-pandemic. Office space will change – with the inclusion of safety barriers for those working in close proximity, less allocation of space per employee as workers alternate working from home and at the office. Workers may be able to work from anywhere and decamp from costly crowded cities to rural areas and small towns. This means that opportunities will be distributed more broadly, as jobs formerly requiring workers to live in costly urban areas provide greater access to labor pools across a wider geographic distribution.

Adjusting to a distributed workforce will require new skills and practices and many companies are working to change policies and adapt processes such as online onboarding to accommodate remote workers. Adapting to the changes will create some unanticipated challenges but look to later in 2021 for a better read on how sustainable remote work arrangement will be if workers become weary of the isolation of remote work and seek to return to the office.

Exponential Automation – Robotics Ascendent

In 2020, work went virtual as the need to minimize human contact and minimize the spread of the COVID-19 virus drove the demand for increased safety accomplished through automation and robotics.

> The International Federation of Robotics estimates that global sales of robotic services are expected to increase from $17 billion in 2019 to more than $55 billion by 2023.

Robotics are transforming manufacturing, warehousing and distribution, even physical security. According to a recent Industry Week survey almost half of respondents identified automation and robotics technologies as either critical or important, with 1/3 saying they have yet to embrace any automation. Looking at actual applications, pick and place is the most common robotic application, followed by material handling and inspection.

Looking forward, we're likely to see big increases in data collecting robots that can share real time inventory updates and product location data with mobile applications, e-commerce order pickers, curbside pickup services and even bricks and mortar store customers and workers.

Expect to see the rise of multi-purpose robots, that are able to perform functions like delivering supplies in a hospital, temperature checks for workers, hazard checks and even disinfecting surfaces with UV light. Robotics are becoming cheaper and more accessible for smaller businesses as well – independent grocers like Woodman's Markets which have increased their deployments of in-store robots. With an aging workforce in developed countries exacerbating tight labor markets, there will be growing need for automation.

New Priorities – Wellness and Corporate Responsibility

In 2020 health concerns took center stage for businesses, as the realities of pandemic risk hit home across the globe impacting nearly every size and type of organization. The first priority of every organization is to ensure the health and safety of employees, and we have seen a shift in focus across businesses as health and wellness (both physical and mental) become increasingly important.

HR departments have broadened their mission beyond talent acquisition and retention to include cultivating the well-being of their people. Many employers are expanding beyond the traditional focus on injury and illness prevention toward a more holistic view. For some companies this may include new programs and enhanced benefits related to mental health, physical wellness, childcare, elder care, paid time off and flexible work arrangements. In response to the pandemic safety concerns, there is growing awareness of the need to reimagine workspace design and layout to maximize both employee connection and safety.

Additionally, businesses continue to ramp up social responsibility efforts – these include expanding diversity in hiring, retention, training and promotion to better reflect the makeup of society at large. Corporate social responsibility is also being emphasized by investors with the rise of ESG (Environmental, Social, and Corporate Governance) funds that focus on measuring ethics, governance and sustainability. The growing cohort of millennials in the workforce is driving the growing focus on social responsibility, and we expect this to increase in the years to come.

SECTION 3

Where We Are Going

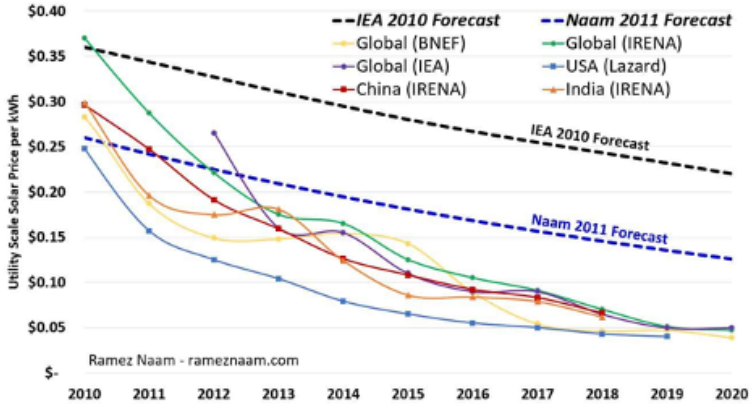
Lastly, we explore Where We are Going – the rise of plentiful, cheap, and clean energy sources, the surging growth of Electric Vehicles displacing traditional Internal Combustion Engine (ICE) vehicles, and the exciting developments around the emerging space economy exemplified by companies like SpaceX. The future of clean energy is becoming ever more a reality as costs decline, promising economically viable alternatives to traditional carbon-based fuels. We explore the following themes in our Outlook:

Energy Gets Cleaner and Cheaper

The multi-decade transition from sole reliance on carbon-based energy to a range of cleaner, cheaper and more sustainable sources of energy continued to progress in 2020. Fossil fuels are expected to increase in 2021 over 2020 but remain below their 2019 peak. Solar energy continues to get cheaper, along with battery technology for storage, and the scope and scale of new installations continued to grow in 2020. The IEA forecasts that additions of renewable electricity capacity will decline by 13% in 2020 compared with 2019, the first downward trend since 2000 as a result of the pandemic. However much of the delayed capacity is slated to come back online in 2021, bring new capacity back to 2019 levels.

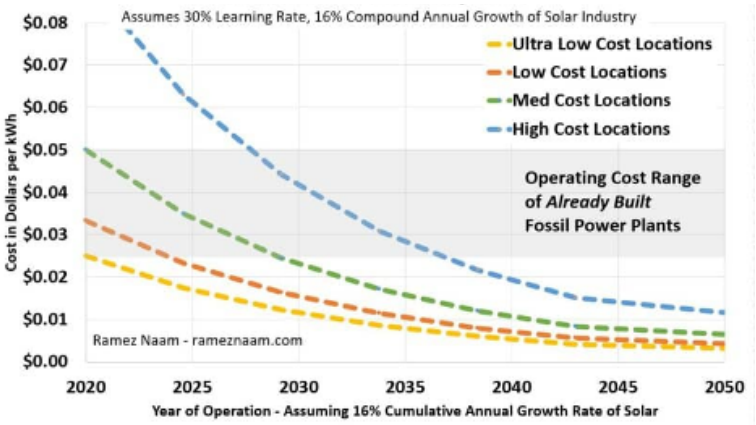
Looking forward the economics of solar will continue to get more attractive as declining costs ratchet down the investment payback period, improving ROI and economic rationale for clean energy adoption. What's behind the strong progress?

Solar Cost A Fraction of 2010-2011 Forecast



Solar prices have dropped faster than anyone expected. Blogger and analyst Ramez Naam has tracked solar prices since 2011, and actual declines have outpaced even his aggressive forecasts. The price of electricity from utility-scale solar projects (the unsubsidized cost) has dropped by a factor of somewhere between 5 and 8 in the years from 2010 to 2020.

Future Solar Cost by Year



Solar prices decline based on the learning rate (costs decline as manufacturers and others in the supply chain gain efficiencies over time) and the cost declines have outpaced the most aggressive forecasts. Projecting forward at a conservative 16% learning rate (consistent with the IAEA's assumptions), this would result in with average prices in sunny parts of the world of penny or two by 2030 or 2035. Building new solar would routinely be cheaper than operating already built fossil fuel plants, even in the world of ultra-cheap natural gas we live in now.

Wind power is also seeing significant declines in costs. Data from the International Renewable Energy Agency shows that from 2010 through 2018, the average installed cost for a wind plant in the U.S. dropped 29%.

Over the same period, utility-scale solar farms saw installed costs decline by 66%, bringing the average cost on a 2018 U.S. dollar per kilowatt basis slightly below that for wind plants. Complementing the declines in costs of solar and wind are comparable costs in energy storage, particularly batteries – with Mega-Factories from Tesla, Samsung, BYD and others coming online, expect to see more hybrid solar/wind/battery installations to define growth in the coming decade and beyond.

Bloomberg New Energy Finance forecasts that Wind and PV Solar will grow to meet 56% of world electricity demand in 2050 – with some countries going as high as 70-80% before hitting economic limits.

New Transportation – The World Goes Electric

2020 was a consequential year for the adoption of Electric Vehicles (EVs). Benefiting from the declining costs of technology (including semiconductors and components) as well as batteries, EVs continue making significant progress into the mainstream. Tesla shipped nearly 500,000 cars in 2020, meeting CEO Elon Musk's predictions from several years ago (that was marked with significant skepticism from the financial community).

2021 is expected to be a breakout year for EVs, with dozens of new models coming to market across the globe with offerings from nearly every major manufacturer. Expect to see variations and options of popular existing models as well as striking new models such as the Tesla Cybertruck (below) which should increase cachet for EVs among consumers.

PHOTOGRAPH: TESLA

Morgan Stanley estimates that global electric-vehicle sales will grow 50% or more in 2021, while sales of internal combustion engine vehicles are expected to grow 2-5%. Global EV penetration is expected to be greater than 4% this year, rising to 31% by 2030.

While the overall auto industry is expected to remain subdued at least for the next couple of years, the growth of EVs, declining cost and increasing performance make the transition away from Internal Combustion Engines one of the critical trends for the next decade. Autonomous capabilities continue to gain ground as well (slowly) as technology outpaces the regulatory environment.

The New Frontiers of Space Tech

Over the past few years, we have seen major breakthroughs in the space industry, with the formation of a new branch of the U.S. Military – the Space Force, successfuly launches re-usable rockets from SpaceX, the first successful private sector manned space mission (also SpaceX to the International Space Station), and significant advances is satellite technology with low-cost hardware (CubeSats).

The pace of launches is forecast to accelerate in 2021. Col. Brande Walton, the vice commander of the 45th Space Wing expect there could be as many as 53 launches from Florida's Space Coast this year, up from 31 in 2020. The first space launch of the year was a SpaceX Falcon 9 launch of a Turkish communications satellite Jan. 7. Notably, three of the 2021 launches planned from Florida's Space Coast will be NASA human spaceflight missions — two by SpaceX and one by Boeing.

> By most measures the space economy is accelerating. Over 80% of the $423 billion global space economy is commercial, with over 1,000 commercial spacecraft launched to orbit in 2020.

New technologies such as reusable launch vehicles, 3D printing in space, and in-space refueling are just a few of the developments that have emerged from entrepreneurs. Morgan Stanley's Space Team estimates that the roughly $350 billion global space industry could grow to over $1 trillion by 2040.

Some of the most exciting developments include the deployment of low cost satellites that can be used to enable a broad range of new services – from tracking penguins in Antarctica to cows in pasture – the breakthroughs of CubeSats promise to unlock a panoply of creative applications ahead. Noteworthy as well are a number of startups and initiatives from companies such as SpaceX, Wellspring and many others that promise to bring internet connectivity to remote areas of the globe as well as in space.

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Momenta delivers digital transformation innovation, growth and leadership across energy, manufacturing, smart spaces and supply chain.

About Momenta

Since 2012, we've been deeply embedded at the intersection of corporates and startups, helping Industrial companies accelerate their digital potential.

Led by deep industry practitioners, our global presence and sector focus provides our clients with innovation, strategy and accelerated growth.

Momenta encompasses leading Strategic Advisory, Talent, and Ventures practices with over 200 IoT leadership placements, 125 industry clients and 40+ young IoT disruptors in our portfolio.

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