SOLACTIVE
German Index Engineering

FUTURE TRENDS 2022

The change of tomorrow begins today

INTRODUCTION

SOLACTIVE FUTURE TRENDS

High conviction trends for megatrend investing

The **Solactive Future Trends** aims to provide an outlook into current and future investment themes driven by the **key drivers that change our world**. The idea is to anticipate megatrends that could significantly impact the world and fuel business growth for current and future corporations.

Megatrends are **major long-term evolutions in society, economics, or the environment**, that affect our lives while driving business growth.

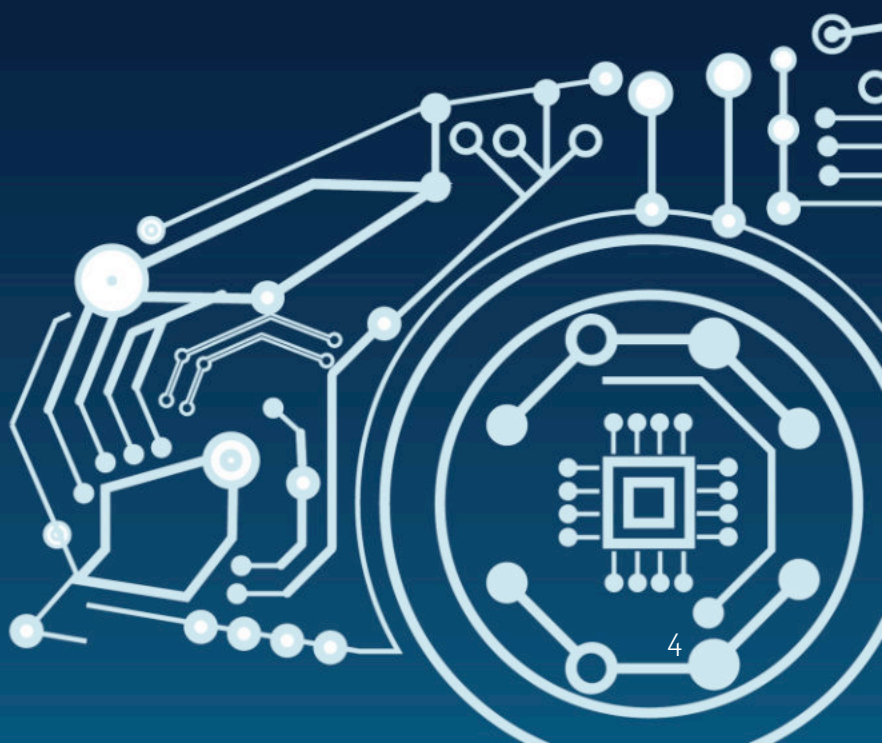
We concentrate on identifying major beneficiaries of specific themes and opportunities, clustered into three categories: **Future Technology, Environmental Change** and the **Future of Health & Living**.

Based on these themes and beyond Solactive will continue to create investable index products to enable investors to invest into these themes and benefit from their growth!

CONTENTS

AUTOMOTIVE ECOSYSTEM EVOLUTION

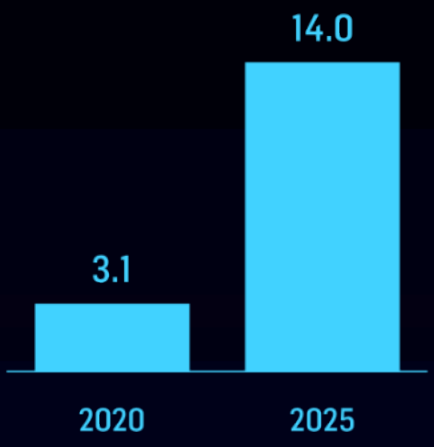
The automotive industry is going through a rapid and disruptive change as we observe the development of alternatives to the combustion engine, and the emergence of electric vehicles and other alternative engine concepts. This will change the landscape of the automotive ecosystem and drive growth in those sectors that provide the right technical solutions and innovations in the fields of Electric Vehicle Manufacturing, Autonomous Driving, Charging Infrastructure, and Battery Technology.

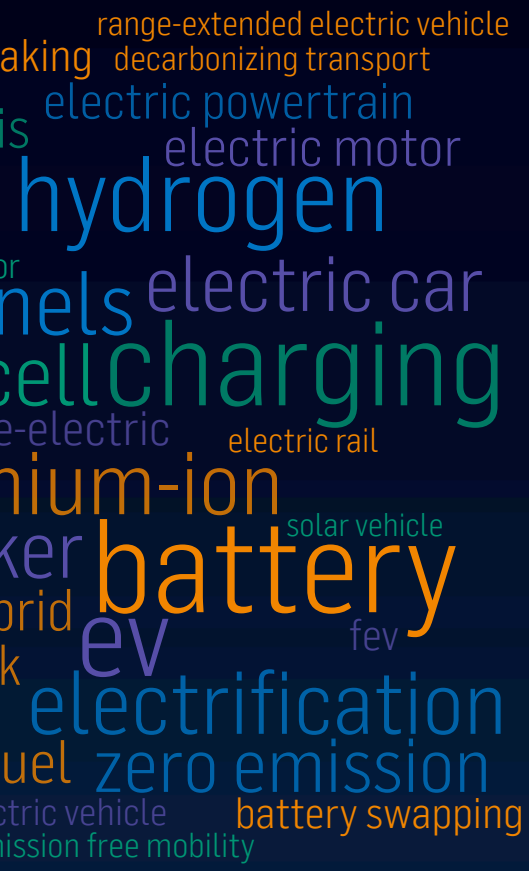


ELECTRIC VEHICLE MANUFACTURING

Thanks to the rapid development of battery technologies and the constant research and development of electric vehicle manufacturers, the safety, price, and efficiency of electric vehicles are no longer concerns among consumers. Worldwide there are currently almost 400 electric vehicle (EV) models available and EV sales have achieved an astonishing 6.7 million units in 2021, compared to just 3.2 million in 2020[1].

Passenger EVs on the roads globally (mn)[1]





With the world focusing increasingly on meeting climate goals such as net-zero carbon emissions or the 2 degree global warming targets, the electric vehicle manufacturing industry is likely a major beneficiary. Through public incentive schemes and the expansion of the public and private charging infrastructure, electric vehicles continue to gain in popularity and usability. Over the next years, new players in the EV manufacturing space will emerge and traditional manufacturers will continue to adjust their model portfolios.

1) https://www.ev-volumes.com/; 2) https://about.bnef.com/electric-vehicle-outlook/

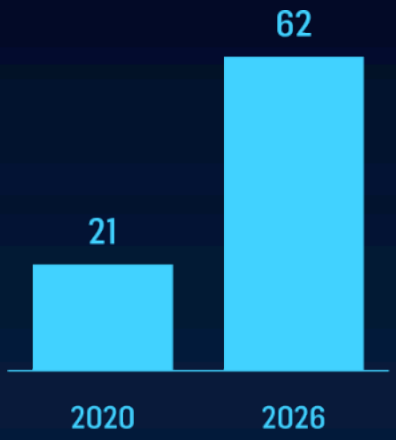
AUTONOMOUS DRIVING

Self-driving vehicles are typically known from science fiction movies, but they are now closer to reality than ever. Autonomous driving is at the brink of a breakthrough, driven by technological advances such as lidar, thermographic sensors, and the rapid adoption of electric vehicles.

Level 2 of partial autonomous driving has long become a standard among a significant part of new cars on the road. Features such as auto-lane changes and cruise control are available as popular options for most new models, and driving assistance features like lane centering or safe distance warnings have become standard setup. The automotive industry continues working and innovating at a fast pace to reach the ultimate stage: Level 5 fully-autonomous driving, where finally drivers should be able to take their eyes off the road and enjoy a nap or read their newspapers.

On the back of decades of conducted experiments, masses of real driving data gathered, and user experiences collected from the ever-increasing array of sensors necessary to support the current stage of autonomous driving, the next level should soon go into mass production. The expected rapid development of AI technologies and new hardware in this space will pave the way to ultimately achieve Level 5. The biggest opportunity for autonomous driving seems to be its usage in commercial fleets, including long haul trucks, delivery vans, buses, and taxis. Producers of the necessary vehicles, sensor technology, and AI systems will find a substantial target market in the coming decades.

Total market for self-driving cars (USD bn)[1]

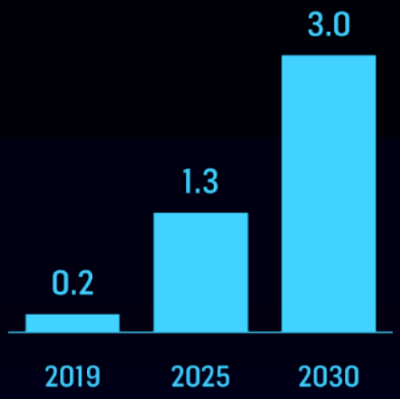


1) https://www.reportlinker.com/p06101202/Autonomous-Driverless-Car-Market-Growth-Trends-COVID-19-Impact-and-Forecast.html

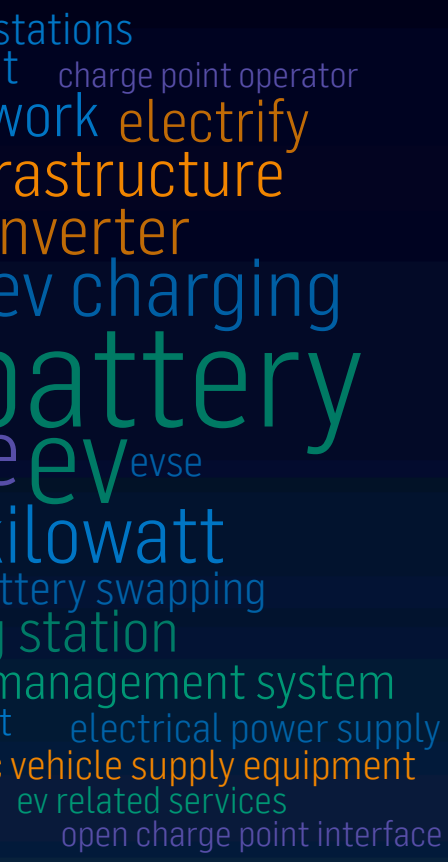
EV CHARGING INFRASTRUCTURE

To facilitate the growth in electric vehicles on the roads, demand for public charging points and private wall-boxes will be substantial. While incentives and technological advances have already increased the number of battery powered vehicles on the road, the charging infrastructure remains relatively underdeveloped.

Projected # charge-points needed in EU[1] (mn)



In order to meet global net zero carbon emission goals, the electric vehicle is likely to dominate new car registrations and sales worldwide by the middle of the century. As a result, heavy investments into the necessary infrastructure are already on the way as both governments and individuals will invest heavily in the expansion of the currently limited charging infrastructure. In Europe, the targets established in the EU's green deal will likely require the number of charge points to more than triple. The European Federation for Transport and Environment estimates that in order to keep up with projected EV numbers, 3 million charge points will be needed in the EU by 2030[1]. In the US, the Biden infrastructure package has pledged investments of USD 7.5 billion to expand the charging network for electric vehicles.

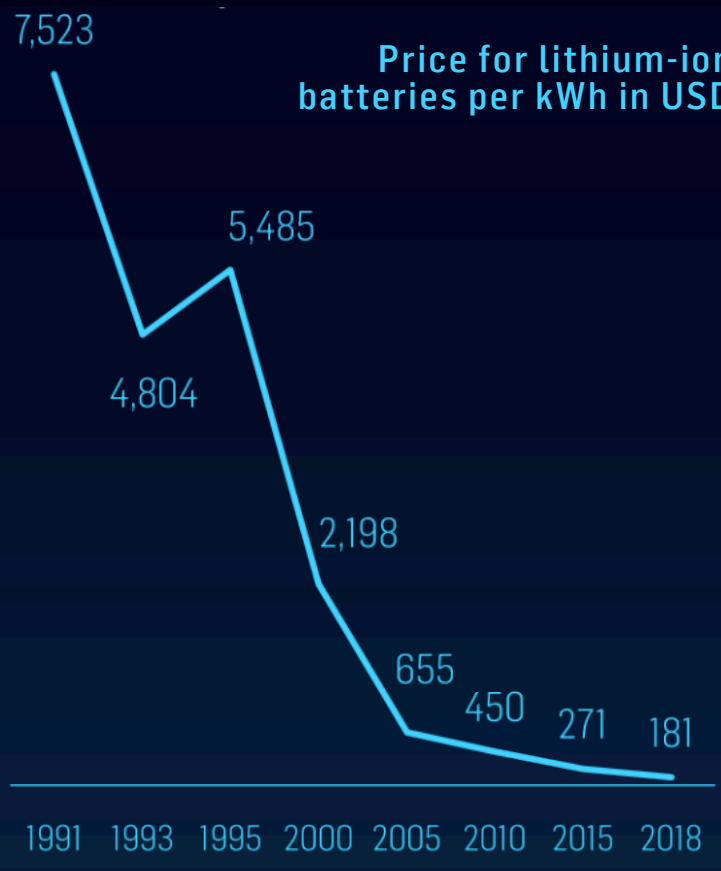


Providers of the charging networks themselves as well as the technology and services to build and support them can be expected to benefit from this growth in demand and new solutions and technologies are likely to emerge.

1) https://about.bnef.com/electric-vehicle-outlook/

EV BATTERY TECHNOLOGY

Originally used for electronics, lithium-ion batteries are now the most favored batteries for electric vehicles. Compared to other battery technologies, lithium-ion batteries have higher energy density, faster charging rate, longer cycle life, and need less maintenance. The persistent research effort on battery technology has lowered its production cost. The production cost of a lithium-ion battery per kilowatt-hour has reduced from more than USD 2,000 in year 2000, to USD 450 in 2010, and to USD 181 in 2018[1]. The ever-increasing demand for batteries, stemming particularly from the growing EV market, will foster an immense, but yet sustainable market growth.



According to Statista, the global lithium-ion battery market will grow at a CAGR of 14.6%, reaching the size of almost USD 92 billion in 2026[2].

1) https://ourworldindata.org/battery-price-decline
2) https://www.statista.com/statistics/1011187/projected-global-lithium-ion-battery-market-size/

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DATA INTELLIGENCE

We live in the age of Big Data. For the first time since the theoretic development of artificial intelligence in the 1950s, we have the computing power and data at hand to develop artificial intelligences that are ahead of humans in many ways. With this rapid evolution, data intelligence is quickly becoming the most important asset for firms that want to succeed in the future. At the same time, the value contained in these data assets will drive the need for more and more computing power as well as adequate protection from cybercriminals.

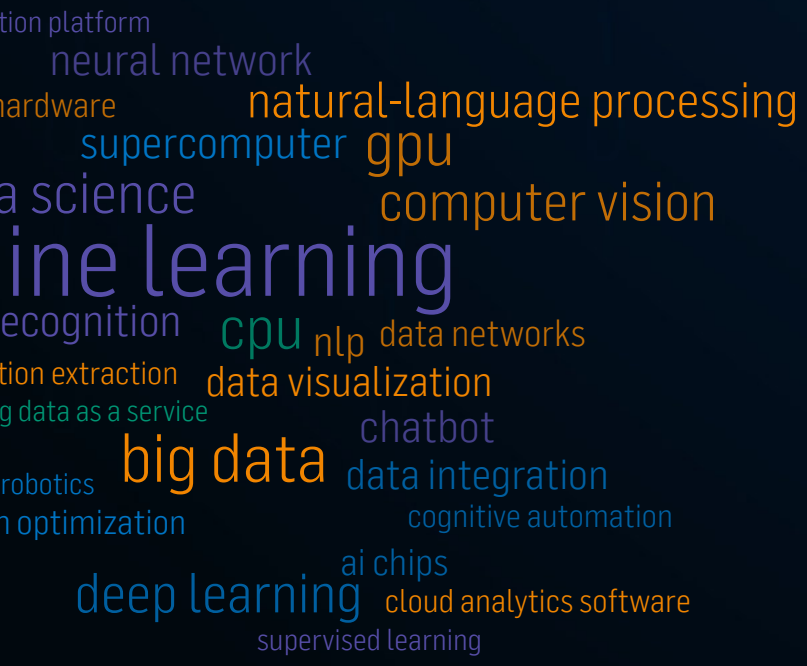
We approach Data Intelligence by looking at the categories Cybersecurity, Computing Power, and Big Data & AI.

BIG DATA & ARTIFICIAL INTELLIGENCE

Estimated amount of global data in 2025[1]

175 zetabytes

The amount of data generated every day is growing exponentially and so are the resulting opportunities. However, analyzing huge data sets with conventional methods is becoming increasingly difficult. This is where artificial intelligence comes into play. Modern machine learning algorithms can use artificial neurons to store and learn from data in a similar way to the human brain, except that machines can process data at a substantially higher rate and therefore learn much faster. That way, machine learning algorithms can be trained to efficiently use these large amounts of data to make predictions or even take decisions. Moreover, modern artificial intelligences are even capable of training themselves thanks to novel machine learning approaches such as deep reinforcement learning. As a result, AIs are becoming less and less dependent on the limited amount of human-generated training data.



Therefore, machines will overtake humans in many activities within the next few years. Activities that still seem impossible today will soon be performed by artificial intelligence.

In 2018, the total amount of data in the world was approximately 33 zettabytes. In 2025, the total amount of data is expected to have quadrupled to 175 zettabytes[1]. One zettabyte is equivalent to 10^21 bytes.

1) https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-dataage-whitepaper.pdf

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CYBERSECURITY

The number of cyberattacks and the resulting financial damage has increased dramatically in recent years. In the years 2016 to 2020, the financial damage caused by cybercrime in the U.S. almost tripled from USD 1.5 billion to USD 4.2 billion[1]. At the same time, the use of online services is becoming more and more essential for both private individuals and companies. The advancing digitalization of almost every sector leads to larger amounts of sensitive data being used and processed online in cloud environments. The increasing value of these datasets and their relevance in companies' growth strategies make them increasingly interesting targets for cyber criminals.

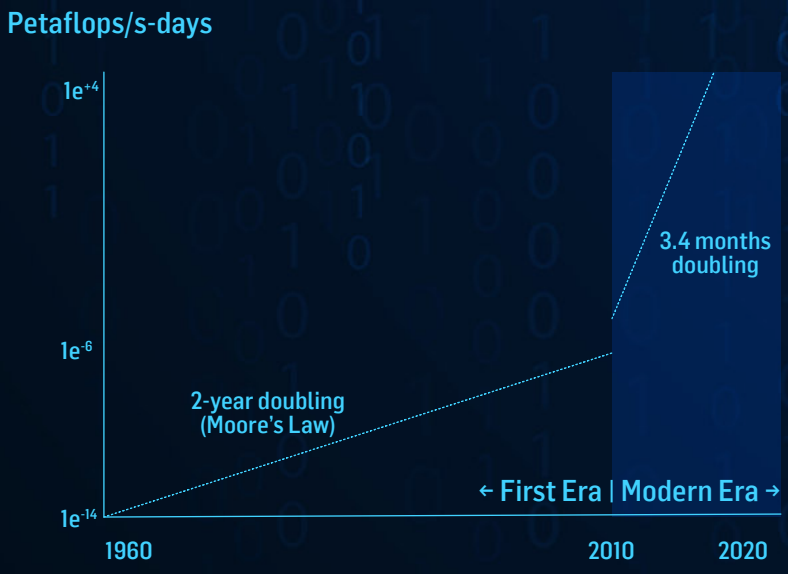
Financial damages caused by cybercrime in the US in 2020[1]

USD 4.2bn

Therefore, cyber security is playing an ever more important role in our world. Significant growth of companies developing new cyber security solutions can be expected. Especially the progress in the field of machine learning offers new approaches to fight cybercrime. Modern cyber security software can learn from every attack and thus constantly improve. Another important aspect regarding the future of cyber security is the development of quantum computers. With quantum computers technology approaching its breakthrough, current cryptography processes could be rendered useless, giving way to the need for an entirely new cryptography infrastructure and industry.

1) https://www.ic3.gov/Media/PDF/AnnualReport/2020_IC3Report.pdf

COMPUTING POWER



For the first time since Moore's law was formulated, computing power is no longer developing as fast as predicted. It seems that the limits of conventional chip building methods have been reached at the hardware level.

At the same time, the demand for computing power continues to grow. Especially the areas of Big Data & Artificial Intelligence require solutions of more and more complex computational tasks. In particular, the latest AI systems require even more computing power than predicted by Moore's law. Research is therefore being carried out at high pressure to provide the necessary computing power solutions:

Cloud computing providers are outsourcing computing power to huge supercomputers and providing hyper-scalable access to computing power. Quantum computers offer a completely new technological approach to computing power. Meanwhile, chip manufacturers continue to research new technologies for developing chips that bring Moore's law back into balance.

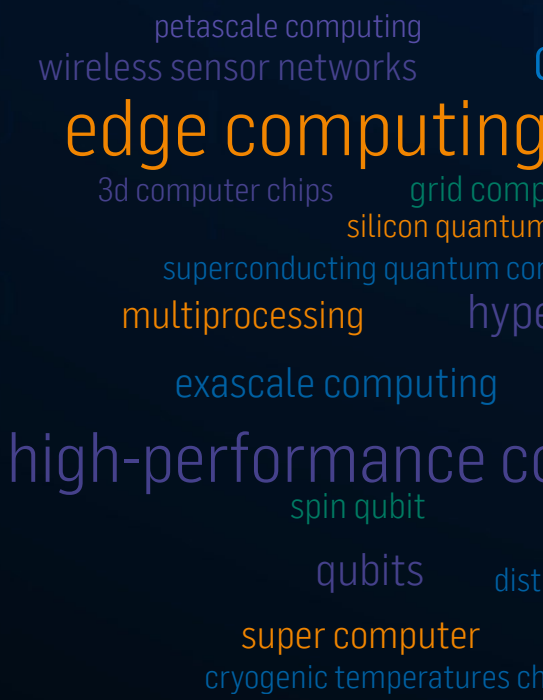
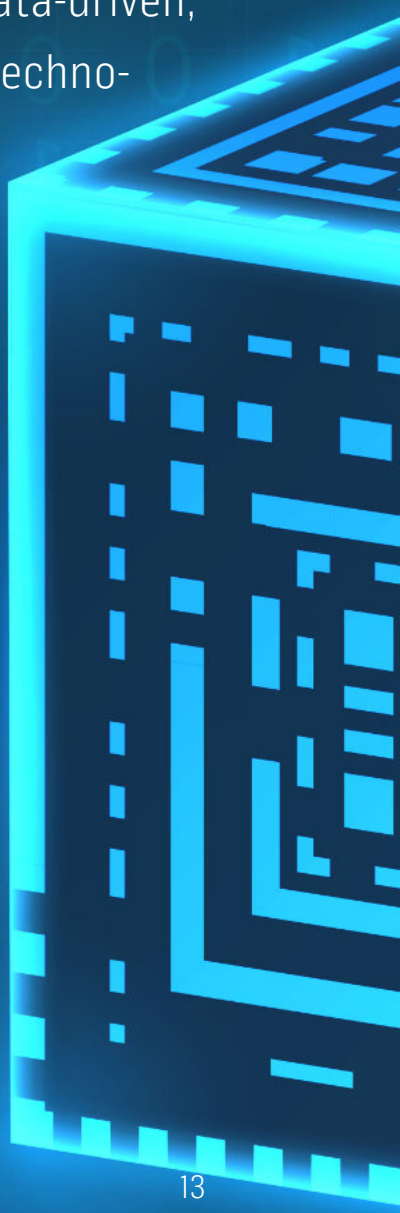


Diagram adapted from: https://openai.com/blog/ai-and-compute/#addendum

WEB 3.0

The internet is at the brink of its next transformational shift into a Web 3.0. While the final definition of this transformation is not yet fully clear, one goal is to democratize content ownership and to build out an entirely decentralized, data-driven, and machine-based network. To achieve this goal, technologies such as blockchains, smart contracts and tokens, as well as machine learning will provide the fundamental building blocks. At the same time, Web 3.0 will accelerate the development of the Metaverse and vice versa. Just like its predecessors, Web 3.0 will bring material changes and alter how the internet is organized and how we interact with it.

We therefore look at Web 3.0 in the following categories: Blockchains, Tokens & NFTs, and Big Data & AI.



BLOCKCHAINS

The third generation of the internet will not rely on big centralized platforms anymore. Instead, it will be fully decentralized and run by the users themselves. Trustless systems like blockchains will provide the new foundation of the internet and replace the big players upon whose infrastructure the current internet is build. To use blockchains at such massive scale, significant investments in the development of the technology will have to be made. After all, there are still substantial capacity limitations among existing blockchains that need to be solved in order to realize an entirely decentralized version of the internet. Companies that are pushing the development and application of blockchains will be major beneficiaries and be at the forefront in designing the Web 3.0.

Estimated blockchain market size in 2030

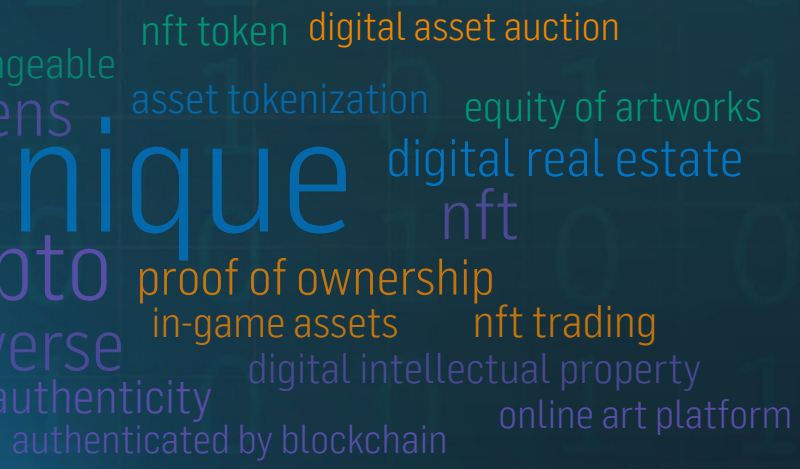
USD 1.4tn

The global blockchain technology market is estimated to grow at a compound annual growth rate of 85.90% from 2022 to 2030 reaching USD 1.4 trillion in revenues[1].

1) https://www.grandviewresearch.com/industry-analysis/blockchain-technology-market

SMART CONTRACTS & TOKENS

While blockchains build the foundation of Web 3.0, technologies that utilize them are just as important. Smart contracts will be one of the key technologies. In a nutshell, a smart contract is an agreement between several parties that is automatically executed when the respective conditions are met. That way smart contracts are another step towards the decentralization of the internet by getting rid of external third parties that are needed to provide trust and enforce agreements. The most famous application of smart contracts are non-fungible tokens (NFTs). An NFT is a representation of any kind of asset, be it a digital or non-digital asset. A key feature of NFTs is that they provide proof of ownership of that asset. An entirely technology-driven proof of ownership is crucial in a fully machine-based version of the internet and as such significant growth can be expected in the NFT space.



According to an industry report from DappRadar, "Last year, the NFT market exploded en route to generate $25.5 billion in trades, 18,400% more than the four previous years combined." They go on and state that this growth rate further accelerated in the first month of 2022[1].

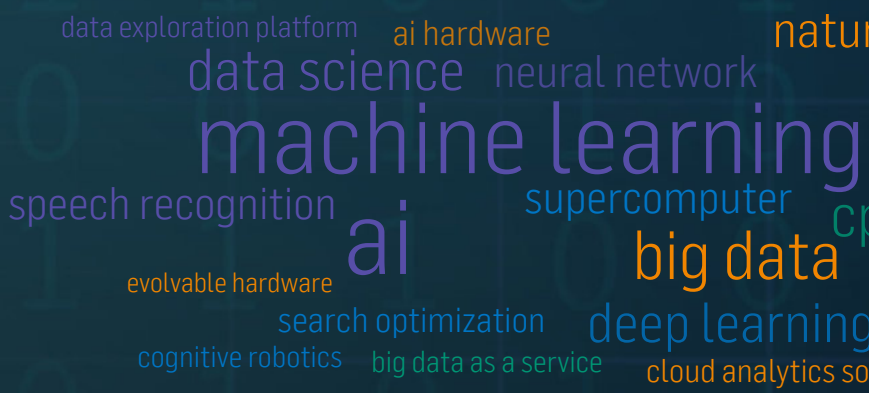
Increase in NFT trades from in 2021 over 2016-2020[1]

18,400%

1) https://dappradar.com/blog/dapp-industry-report-january-2022

SEMANTIC WEB

Going from Web 1.0 to Web 2.0 led to a substantial increase in data generated. Nowadays, huge amounts of data are processed, stored, and distributed every second. New technologies have been developed to handle that data. In a fully decentralized version of the internet, however, the methods of storing, distributing, and accessing that data will change significantly. Distributed file systems will replace centralized platforms to store data. How users access and use data will be heavily supported by artificial intelligence. Instead of consuming content as determined by someone else's preferences, an entirely personalized experience will be generated by machine learning algorithms. Each user's browsing experience will be unique and customized to their individuals needs and interests.



Companies involved in the exploration of big data technologies and artificial intelligence will grow at considerable speed and shape the future of the internet.

4.4 billion users of the internet produce a total of 2.5 quintillion bytes of data every day[1].

2,500,000,000,000,000,000,000,000,000 bytes
= 2,500,000,000,000,000,000,000,000 megabytes
= 2,500,000,000,000,000,000,000 gigabytes

1) https://data.worldbank.org/indicator/it.net.user.zs and https://www.domo.com/learn/infographic/data-never-sleeps-5

METAVERSE

The Metaverse is a virtual 3D world that will revolutionize the way we see the world, interact with each other, and do business. The potential of its application in different industries is tremendous, providing huge investment opportunities. Goldman Sachs estimated that the Metaverse including its related industries has a potential market of eight trillion U.S. Dollars.

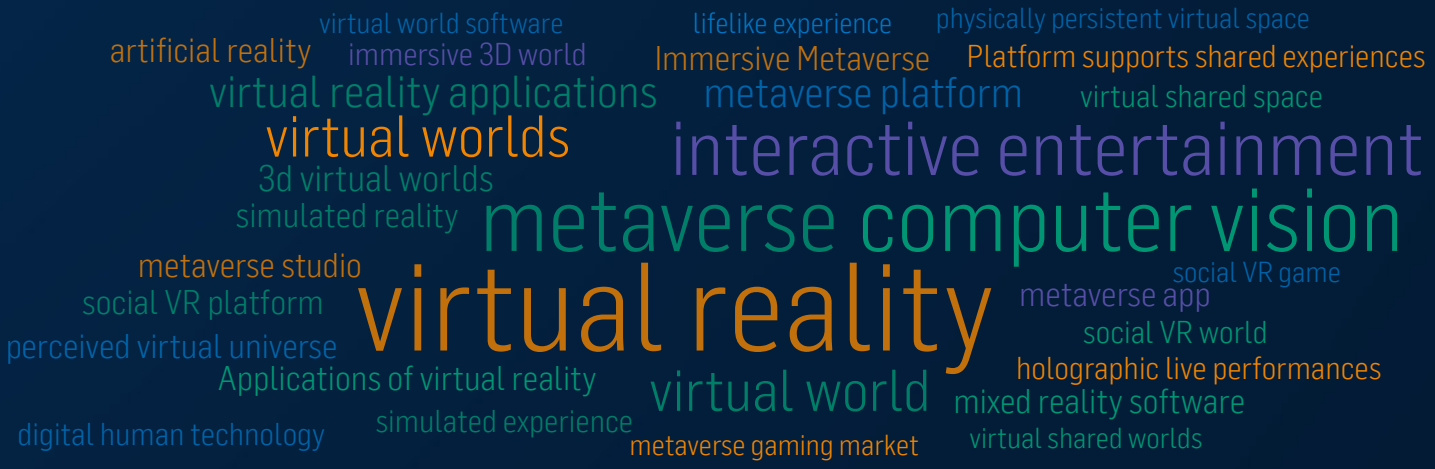
In this report we examine the Metaverse components Platform, AR/VR Devices, Technology Infrastructure, and Applications.

METAVERSE PLATFORMS

Big-techs have acknowledged the potential of the Metaverse and are willing to take advantage of their established client base and service offerings to transform into platform providers of different Metaverses. Although the ultimate goal is having an overarching singular and interoperable Metaverse, currently different incarnations of Metaverses with different focuses and scopes are being developed. Metaverses that focus on office collaboration will support better interactions and create more project management and interaction features; Metaverses focused on engineers will emphasize the scalability, accuracy, and integration ability from different input sources, while gaming Metaverses will further improve immersion through enhancement of sounds and visual effects.

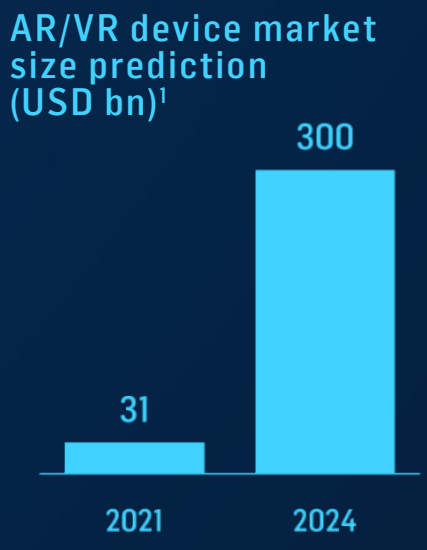
Estimated market potential for Metaverse[1]

USD 8tn



1) https://www.goldmansachs.com/insights/pages/gs-research/framing-the-future-of-web-3.0-metaverse-edition/report.pdf

AR + VR DEVICES



The rising importance of the Metaverse is highly likely to be a driver for the rejuvenation of the Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR) industries. Despite the wide accessibility of the Metaverse via different devices, having an immersive experience is probably the ideal way to experience the Metaverse. Besides traditional head mounted displays for VR and smart glasses enriched with more interactive features, we will presumably see the emergence of deeper integrated versions of heads-up displays and holographic displays. Lighter, thinner, and cheaper devices will help to expand the user base and offer a better user experience. Sensors and haptic motors on suits and gloves, together with acoustic sound systems will provide users the realistic environment needed for a full-on Metaverse experience. These innovations and technological advances are most likely to drive growth in the hardware market for such devices.

1) https://www.statista.com/statistics/591181/global-augmented-virtual-reality-market-size/

METAVERSE TECHNOLOGY INFRASTRUCTURE

Projected market CAGR[1]

22%

Companies that provide the technical foundation for the creation of Metaverses can be expected to receive more orders thanks to the rapid development of various Metaverses. This includes companies that provide game engines, 3D solutions, interactive sound solutions, eye tracking analysis, real time translation, and so on. Gigantic amounts of data will be generated by Metaverse users. Data processing and data centers as the underlying infrastructure of all the applications will all face a strong demand.

METAVERSE APPLICATIONS

Different applications will find their home in the digital space that the Metaverse creates. The gaming sector as one obvious beneficiary can be expected to enter another transformational growth phase, while content creators, including NFT artists and influencers, will benefit from the new multimedia and distribution tool. But also the traditional economy will find new ways of providing services and interacting with customers in the Metaverse. E-commerce and digital payments will likely also see rapid growth as the Metaverse use cases break through and gather momentum.

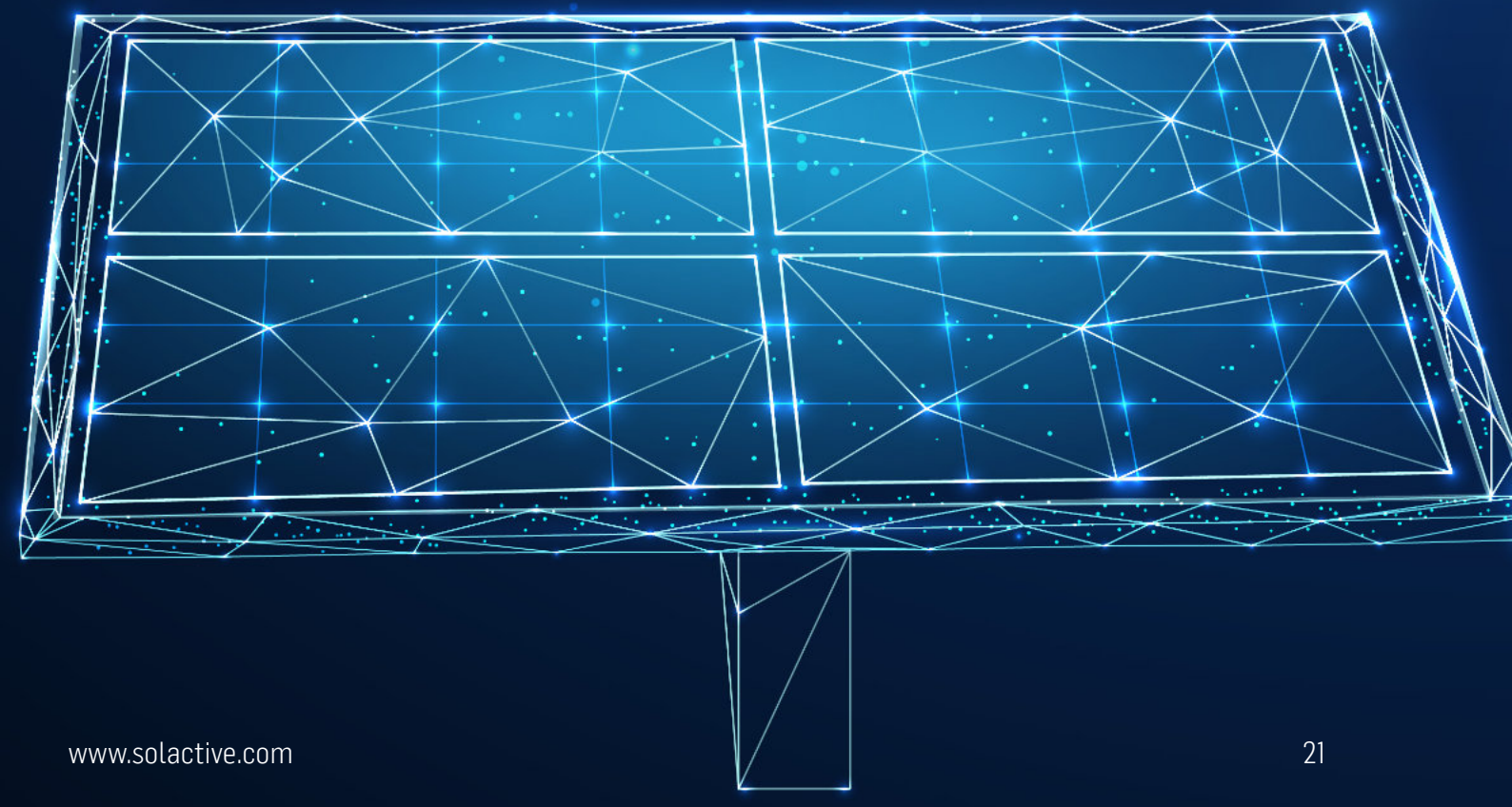
NFT Trading Volume in 2021[2]

USD 23bn

1) https://www.researchandmarkets.com/reports/5206637/global-game-engines-market-by-type-by;
2) https://www.researchandmarkets.com/reports/5403235/eye-tracking-market-by-type-application-and; 3) https://dappradar.com/blog/2021-dapp-industry-report

CLEAN ENERGY

The fight against climate change will need to rely heavily on the emergence and increased use of renewable energy sources. Hydro-, wind, and solar power currently account for 95% of the sustainable power capacity but only 28.6% of total energy generation. The International Energy Agency (IEA) estimates that the renewable shares of total energy need to take up 60% in 2030 to meet the Net Zero Emissions by 2050 Scenario. Companies that are operating in this industry or are part of the value chain will likely benefit substantially from this trend.



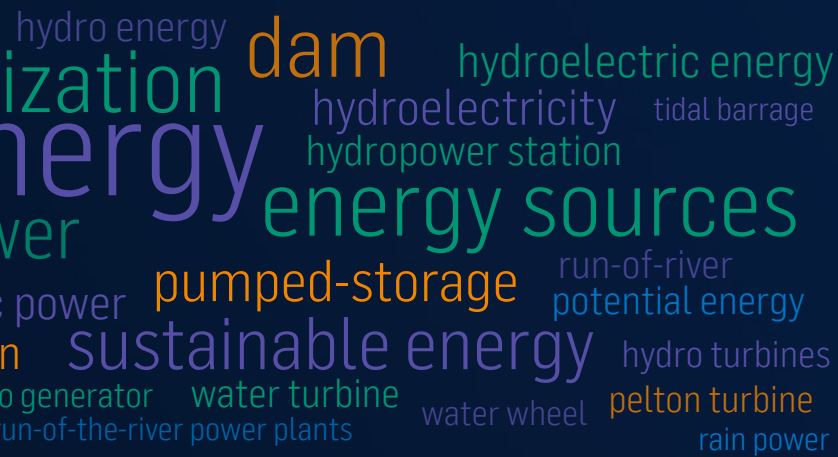
HYDROELECTRICITY

Hydroelectric energy is the largest and the oldest source of renewable energy in use today. In contrast to intermittent renewable energy sources, like solar and wind, hydroelectricity generation is controllable and thus can provide a more stable power output.

Projected market CAGR[2]

5.9%

According to IEA, hydroelectricity takes up 16% of the worldwide power generation in 2020, more than the combined power generation from all other renewable energy sources[1]. There is a great potential for growth in developing regions such as Africa and Southeast Asia due to the economic development in these regions and the corresponding need for energy. The global hydropower market is expected to expand at a CAGR of 5.9% from 2020 to 2027, according to Allied Market Research[2].



Lower energy prices in the past years have provided less incentive to invest substantially into this infrastructure and there are growing concerns regarding ecological risks of the technology. Newer, more efficient, and less invasive technologies such as run-of-the-river-power plants as well as current hikes in energy prices are likely to create further demand in the coming years.

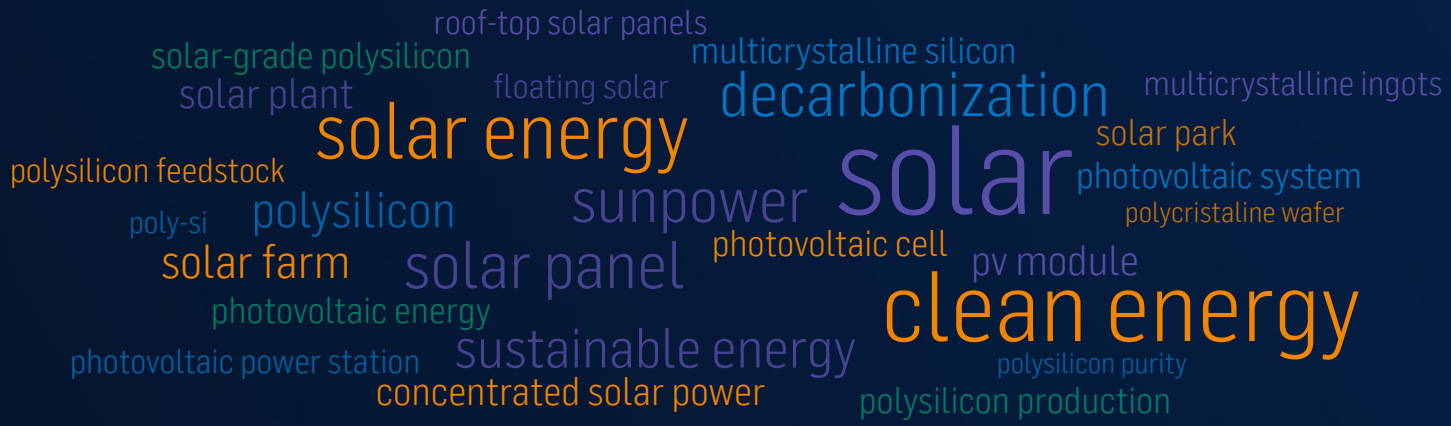
1) https://iea.blob.core.windows.net/assets/4d2d4365-08c6-4171-9ea2-8549fabd1c8d/HydropowerSpecialMarketReport_corr.pdf
2) https://www.alliedmarketresearch.com/hydropower-generation-market-A09456

SOLAR ENERGY

The sun is the ultimate energy source of the solar system. We have benefited more from the sun, after acquiring the technology of transforming solar power into electricity. The solar cell efficiency has increased over the years, leading to smaller solar panels and the emergence of thin-film solar cell, thus lower implementation costs of photovoltaic (PV) systems. The International Renewable Energy Agency found that the cost of solar PV systems has dropped by 82% over the last decade alone[1]. The IEA reported that the PV capacity net annual additions have doubled in the last five years, and solar PV will account for almost 60% of renewable energy addition in the forecast for 2020-2026[2]. This growth is driven by utility-scale solar farms as well as rooftop solar panels for domestic usage. Photovoltaic system can be further combined with other facilities, e.g., carport roof, EV charging station, to expand its usage scenarios.

Projected market CAGR[3]

25%



1) https://www.solarpowerportal.co.uk/news/solar_pv_costs_fall_82_over_the_last_decade_says_irena
2) https://www.iea.org/reports/renewables-2021/renewable-electricity?mode=market&region=World&publication=2021&product=PV
3) https://brandessenceresearch.com/energy-and-mining/solar-panels-market-size-and-share

WIND ENERGY

Wind turbines are being installed across the globe. A modern wind turbine can generally last for 20 years, proving a permanent source for cost and carbon free energy. According to the World Wind Energy Association, 93 gigawatts of new wind turbines were added in the year 2020 alone[1].

However, subsidies remain essential for further construction of further wind farms. The installation cost for wind turbines is roughly USD 1 million per megawatt of capacity with a payback period of about three years[2]. Nevertheless, wind power is a key component in most national renewable energy strategies, increasing the expected investments in this sector.

Allied Market Research estimated that the market growth will be further growing at a CAGR of 9.3% from 2020 to 2027[3].

The number of newly installed wind turbines in 2020 can be translated to one new onshore wind turbine installed every **11 minutes.**

1) https://wwindea.org/worldwide-wind-capacity-reaches-744-gigawatts/;
2) https://enerpower.ie/2011/03/30/wind-turbine-payback-period/
3) https://www.alliedmarketresearch.com/wind-energy-market-A10536

HYDROGEN

Today, hydrogen is mainly used for the industrial production of chemicals. However, hydrogen is one of the most promising energy carriers, as it has a very high energy content per unit weight. Hydrogen can be produced from a variety of raw materials but is currently most reliant on natural gas. Generating so-called green hydrogen from water via electrolysis using renewable energies is a promising and growing sustainable technology for the future.

Projected market size in 2050[1]

USD 120bn

The Energy Transitions Commission estimates that an investment of almost USD 15 trillion is needed until 2050[1]. The European hydrogen market alone could achieve a volume of EUR 120 billion per year according to Aurora Energy Research[2]. The costs to produce clean hydrogen are already decreasing all along the value chain. If production costs can be lowered further the adoption of the technology will likely accelerate significantly.

1) https://www.energy-transitions.org/wp-content/uploads/2021/04/ETC-Global-Hydrogen-Executive-Summary-Short.pdf
2) https://auroraer.com/media/hydrogen-could-be-120-billion-industry-in-europe-by-2050/

RESOURCE EFFICIENCY

For a long time, humanity has treated the planet as if its resources were infinite – but they are not. Limited deposits of natural resources meet an ever-growing demand due to economic development. However, unlimited human ingenuity allows us to find new energy sources and to increase the efficiency and utilization rate of existing resources. Eventually, the reduction of waste, cutting of costs, and preservation of resources will enable us to achieve our climate goals.

Relevant technologies in this field are energy storage, recycling, and water management.

ENERGY STORAGE

Projected market CAGR 2020-2027[1]

14%

Storing energy is critical but difficult. Renewable energy sources like solar and wind have an unlimited, but not stable supply. Energy storage can help to fully utilize the generation capacity by providing a smoothened stable power output. Battery storage capacity is constantly increasing, and in 2020 new installation rose by 50% compared to 2019, according to the IEA. It reflects the rising awareness of the role of energy storage. Utility-scale energy storage costs have decreased tremendously in recent years. Apart from improving flexibility and efficiency of green energy, energy storage also provides reliability for industrial production, hospitals, and families in case of outages. The storage density, capacity, discharging time, and efficiency vary vastly by technologies. Pumped storage hydropower (PSH) accounts for 95% of utility-scale energy storage in the U.S[1]. Global Market Insights estimates that the PHS market will continue to grow at around 10% CAGR from 2022 to 2028[2].

Batteries currently contribute a relatively low volume on a global storage scale[3], but they will catch up as we expect a spill-over effect from the EV battery technology development. According to Grand View Research, the global battery market size will grow at a CAGR of 14.1% from 2020 to 2027[4].

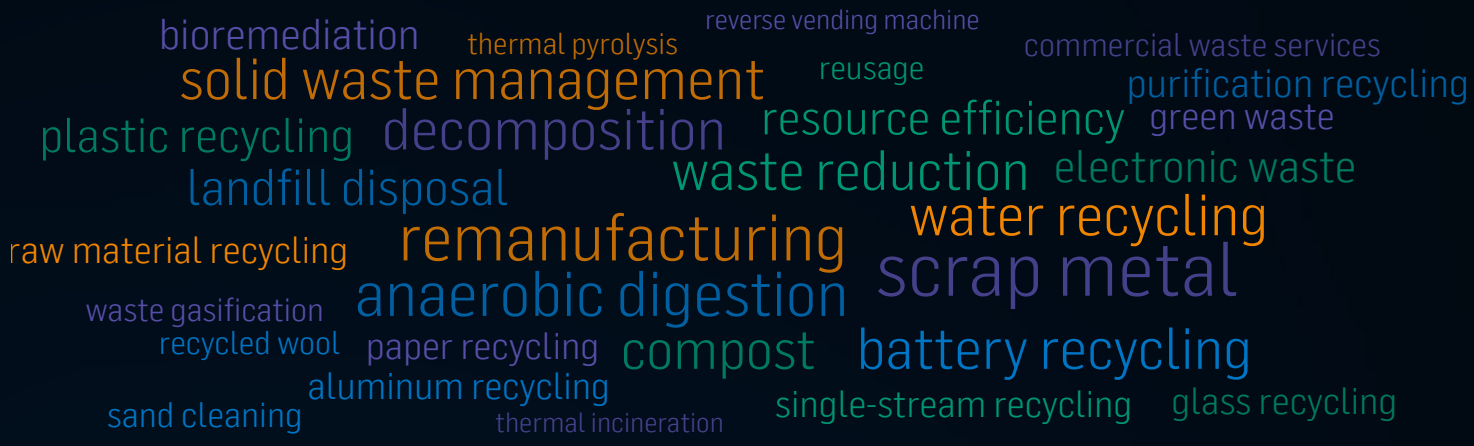
1) https://www.energy.gov/eere/water/pumped-storage-hydropower
2) https://www.gminsights.com/industry-analysis/pumped-hydro-storage-market
3) https://www.iea.org/articles/will-pumped-storage-hydropower-expand-more-quickly-than-stationary-battery-storage
4) https://www.grandviewresearch.com/industry-analysis/battery-market

RECYCLING

Projected market size in 2030[1]

USD 369bn

Minerals and ores are scarce on our planet and the deposits are steadily depleting. Apart from having recycling efficiencies of almost 100%, steel and aluminum also require tremendously lower energy usage to be recycled than new production. Given the continuing industrialization in emerging markets and infrastructure plans in developed countries like the United States, we can expect further increases in metal demand. Many of the so-called rare-earth metals are crucial to clean technologies, and the recycling process also generate less pollution. Less than 5% of rare earth metals are recycled to date, according to Recycling International, providing a huge potential in the future. Allied Market Research predicts that the global metal recycling market will reach USD 368.7 billion by 2030, with a CAGR of 5.2% from 2021[1].



Currently, the cost of plastic recycling is not lower than its production cost. If the recycling system can increase incentives, a higher recycling rate will likely ensue driven by our common goal to have a cleaner environment.

1) https://www.alliedmarketresearch.com/metal-recycling-market

WATER MANAGEMENT

More than two billion people lack access to safely managed and clean drinking water[1]. Our limited water resources are threatened by increasing consumption, pollution, as well as rapid urbanization with inadequate planning. Water stress can be reduced by investments into sustainable water management facilities. Investments in water storage, distribution, and other necessary water acquiring infrastructures will provide better water access to people. Water purification and desalination can provide extra water supply to people who face physical water scarcity. Wastewater treatment is the most essential aspect of water management. Treated water can be used for industrial water supply, irrigation, or even reach drinking water quality, while at the same time reduce the water pollution. According to Markets and Markets, the water management market size will grow to USD 22.4 billion in 2026, at a CAGR of 10.1% from 2021[2].

Projected market CAGR[2]

10%

1) https://www.unwater.org/water-facts/scarcity/
2) https://www.marketsandmarkets.com/Market-Reports/smart-water-management-market-1265.html

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DIGITAL TRANSFORMATION

The integration of digital technology at different levels of the value-chain is improving existing processes aiming towards increased efficiency and a better customer experience.

This redesigning of established businesses is creating new innovative processes to tackle existing problems. Even conservative businesses are now starting to be disrupted and it becomes clear that digital transformation will not come to a halt.

FINTECH

FinTech unicorns in March 2022[1]

222

Financial technology firms are the most prominent example of a subindustry that very successfully incorporated technology to lower the costs of offered services, to increase efficiency and scalability. The technologically facilitated availability and level of customer support, lower fee structures, and an often overall improved customer experience have fostered growing customer acceptance and financial literacy. The rise of robo-advisors which provide algorithm-driven financial planning services are a pristine example of how technology can change a business, formerly reliant on personal interaction. Pioneering developments like decentralized finance (DeFi), digital assets, and smart contracts massively gain in importance and will continue to shape the financial landscape. The sheer monetary potential of these disruptive innovations is best demonstrated by the existence of 222 FinTech unicorn companies, which is with over 20,8 percent of all private companies valued at USD 1 billion or above, the most contributing industry, as of March 24, 2022[1].

1) CB Insights Global Unicorn Club 2022 Report

LEGALTECH

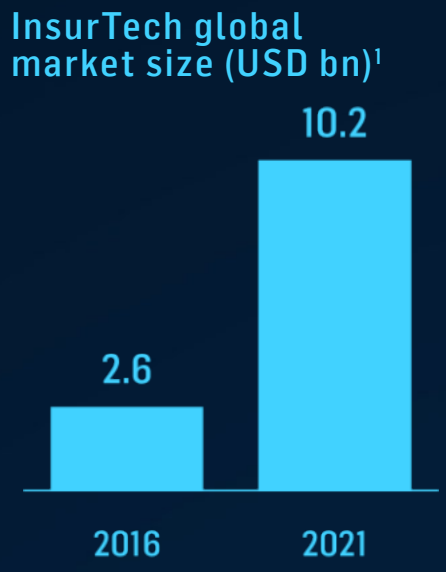
The traditionally conservative law industry has also started to open to digital transformation. Incorporating modern technology and software allows firms to improve the overall efficiency and to adapt to a progressively popular agile workplace.

Existing LegalTech companies are already changing each aspect of the value chain of providing legal services ranging from document management systems, over automatic contract generation to AI supported due diligence processes. The potential for cost-cutting and efficiency enhancement makes LegalTech a definite game changer in the world-spanning legal ecosystem. Therefore, the overall market size is predicted to grow from $17.3 billion in 2020 to over $25.1 billion in 2025, amounting to a compounded annual growth rate (CAGR) of over 6 percent[1].

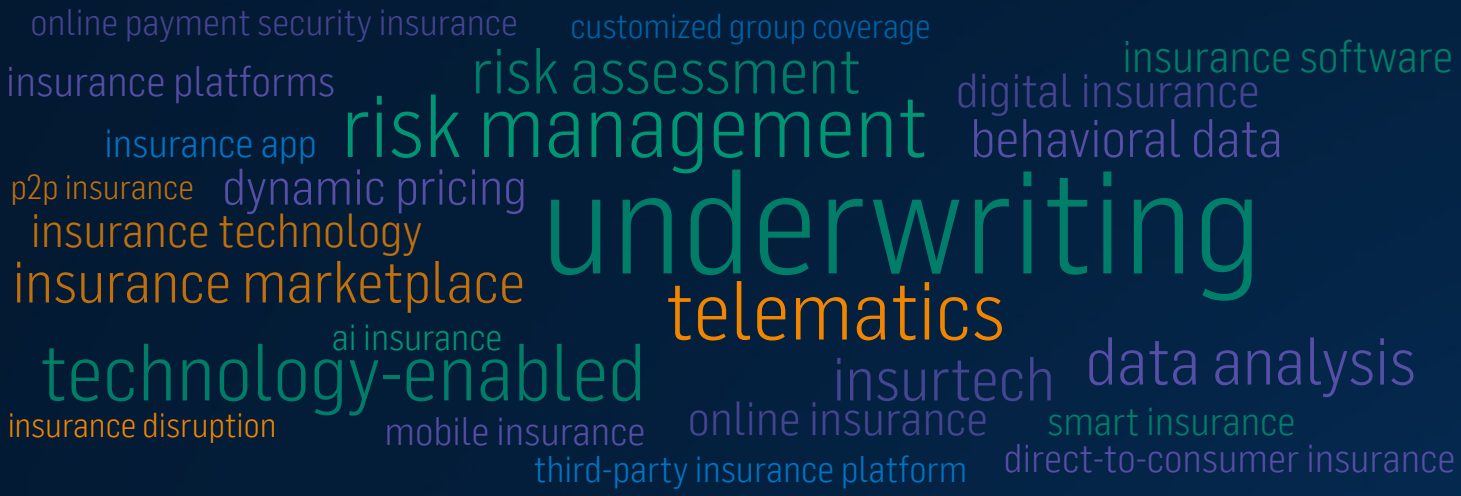
1) https://www.statista.com/statistics/1155852/legal-tech-market-revenue-worldwide/

INSURTECH

These companies belong to the insurance industry and leverage new technologies to innovate each aspect of the classical insurance business. The multifaceted characteristics of the insurance ecosystem ensures a continuous emergence of new ideas and innovation.



Although the insurance market is heavily regulated, data analytics, AI, and self-learning algorithms improve the accuracy of risk calculation and therefore allow more specifically tailored insurance solutions. These technologies are equally important for automated claim management systems, massively increasing the efficiency and reducing the time of settlement. The data shows that there is a clear trend towards technology in the insurance industry.

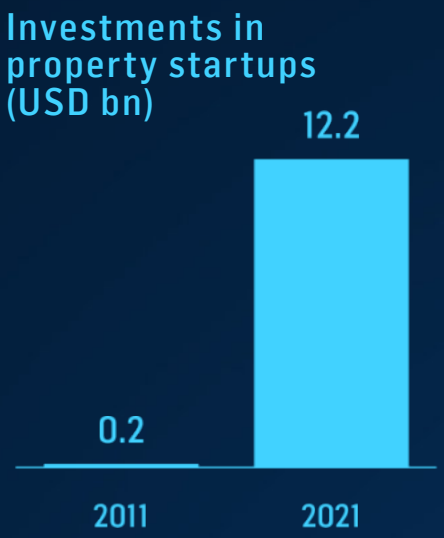


1) https://ftpartners.docsend.com/view/86nscvzau25gb5ew

PROPTECH

PropTech or property technology evolves around the adaption of digital technology in the area of real estate.

There are countless possible applications for technology to increase efficiency, innovation, and the level of service. Co-working, co-living, and home sharing concepts are good examples of how technological advances can foster the efficient use of housing and workspace. Moreover, construction and asset management gain massively from progress in real-time data analytics, scalability, and automation. Individuals are affected as frictions in the P2P markets are reduced. Purchasing, renting, or selling a property becomes less complex, as for example financing activities are rethought. Nowadays, acquiring fractional ownership of assets or crowdfunding real estate development projects are no marginal phenomenon anymore. With a CAGR of nearly 50%, the worldwide annual investments in property startups have rocketed from roughly USD 150 million in 2011 to over USD 12.2 billion in 2021 and there is no sign of stagnation[1].



1) https://www.wsj.com/articles/real-estate-venture-boom-is-tested-by-stock-markets-slide-11645538400?mod=Searchresults_pos1&page=1

FUTURE HOME

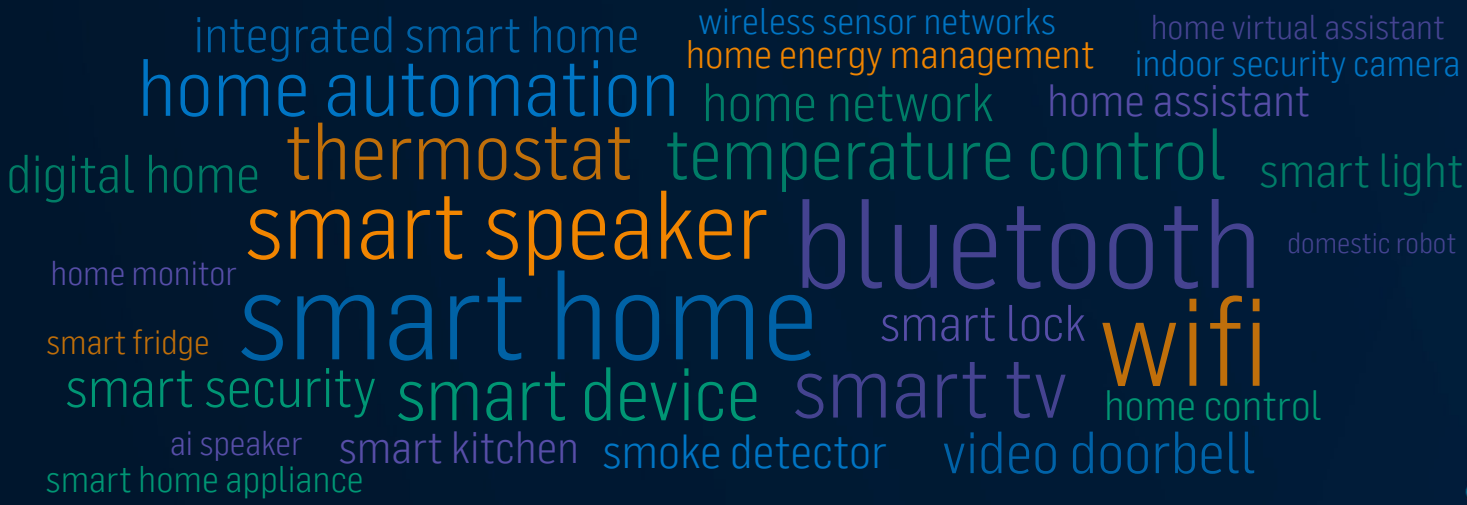
Technology is rapidly transforming the way we live, and makes our homes smarter and more energy efficient. Home automation allows us to reduce energy consumption and hence costs while at the same time increase the comfort of living. Smarter and connected homes also address the needs of an increasingly ageing population and increasing energy costs.

HOME AUTOMATION

Projected market CAGR

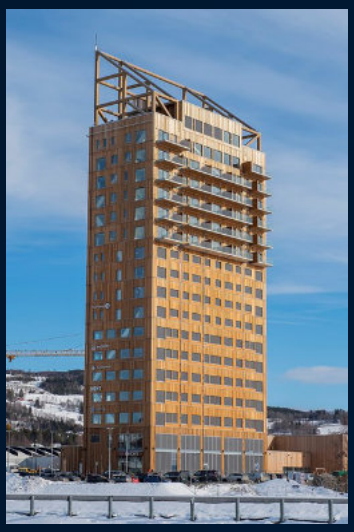
13%

Technology has entered every aspect of our daily life, including our home. Maintaining a house at a moderate temperature requires a huge amount of energy. To keep our carbon emission low, we need precise control of our energy consumption. Well-connected sensors can not only assure the target temperature, but also provide ideal lighting and humidity for us. Most people strive to maximize the comfortability of their lifestyle. With the advancement of the internet-of-things, not only home electronics like speakers and smart TVs are well connected, but also domestic appliances such as fridges or washing machines. These smart devices also collect large amounts of data that enable companies to further optimize their product offerings. According to Statista, Smart Appliances take up the highest market share of smart home industry, with 38% in 2021. It is followed by Control & Connectivity with 20% and Security with 15%. The industry revenue is projected to experience a rapid growth with a CAGR of 13% by 2026[1].



1) https://www.statista.com/outlook/dmo/smart-home/worldwide%23revenue

GREEN BUILDINGS



The world tallest wooden building is Mjøstårnet in Norway - 18-storey / 85 meters .

Apart from smart gadgets, people also start to look at eco-friendly building materials to create sustainable and energy efficient buildings without compromising the standard of living. Although concrete is a thermally efficient material, the cement production contributes to 8% of the world's CO2 emissions. Engineered wood on the other hand is a superior green building material, which can provide strong support as a construction material. The engineered wood production generates much less CO2 than the concrete and steel production, while the wood itself stores and locks-in carbon. According to estimates by Allied Market Research, the engineered wood market alone will grow at a CAGR of 6.2% from 2020 by 2027[1].

From an energy saving perspective, using double glazed windows with low-emissivity glass can prevent heat loss. Setting up rooftop solar panels or solar water heaters are low-cost energy saving solutions for domestic use. Many other emerging passive cooling technologies can help creating comfortable and low-cost energy efficient homes.

1) https://www.alliedmarketresearch.com/engineered-wood-market

AGRI-TECH AND FOOD INNOVATION

Agri-Tech, nutrition solutions, and dietary supplements address two important challenges of today's world: ensuring nourishment for a growing population projected to reach 10 billion people by 2050 and providing healthy, climate friendly, and sustainable food solutions. This growth in demand has led to a rapid development of science-based food and agriculture solutions.

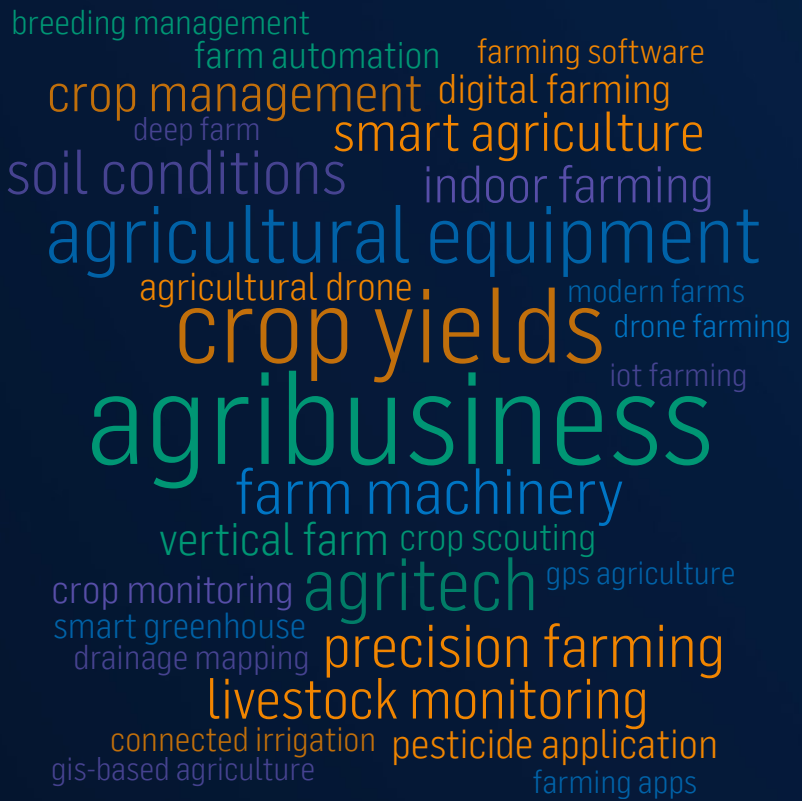
AGRICULTURAL TECHNOLOGY

Global population growth and the need to keep the world's population nourished is one of the key challenges for humanity over the next decades. The ever growing demand for food is driving innovation and investment in new and more efficient farming and food production methods. Further challenges driven by industrialization and lifestyle changes are scarcity of water and accessible farmland.

Projected market CAGR[1]

24%

Innovations in farming and agriculture like precision irrigation systems, horticultural lighting, and drone farming to name a few have already increased the efficiency of resource usage as well as farming productivity. Further advances in this sector can be expected with artificial intelligence and robotic solutions beginning to be employed for example in the detection of weeds and the targeted use of both pesticides and fertilizers.



In urban settings the use of Hydroponics or, in other words, vertical farming, is innovating the way the limited space in large cities can be more efficiently used for planting and growing food while at the same time adding benefits in air quality and temperature controls.

According to BIS Research, market of agriculture technology-as-a-service is expected to grow with a 24% CAGR from 2021 to 2026[1].

1) https://www.millioninsights.com/industry-reports/precision-farming-market

FOOD INNOVATION

Plant based food market size in 2030[1]

USD 162bn

The food industry is poised for major disruption as consumers increasingly accept and demand innovative food solutions. Drivers for this shift in the food industry are for example the increasing awareness for carbon impact of meat farming, animal welfare considerations and the desire for healthier and more optimized nutrition. Plant-based and organic meat alternatives are already hitting high-street food outlets and organic meat could well become a real and scalable alternative to the carbon intensive breeding of cattle. Using plant-based resources such as soy or peas or even insects may well be the growth segment to watch out for in the food industry.

Science based nutrition supplements and alternatives on the other hand promise to offer healthier and more efficient nutrition. With ongoing innovation these supplements are improving in categories like taste and texture to become real alternatives to often more expensive plant and vegetable based diets. With an increased focus on self-optimization and personal health and fitness, the market for individually aligned diet plans and nutritional supplements is already beginning to take off.

The plant-based food market is expecting an explosive growth at more than 18% CAGR in the next decade, reaching USD 162 billion in 2030 as estimated by Bloomberg Intelligence in 2021[1].

1) https://www.bloomberg.com/company/press/plant-based-foods-market-to-hit-162-billion-in-next-decade-projects-bloomberg-intelligence/

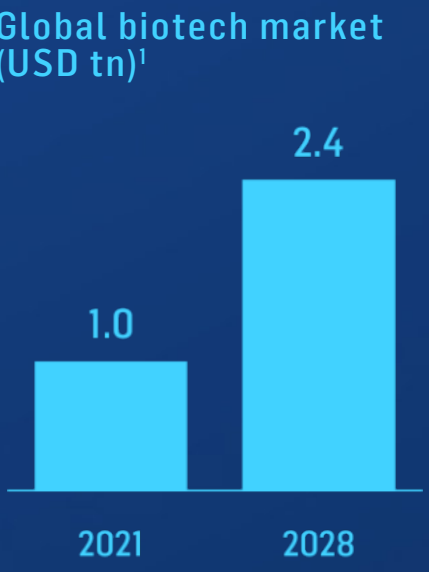
SMART HEALTHCARE

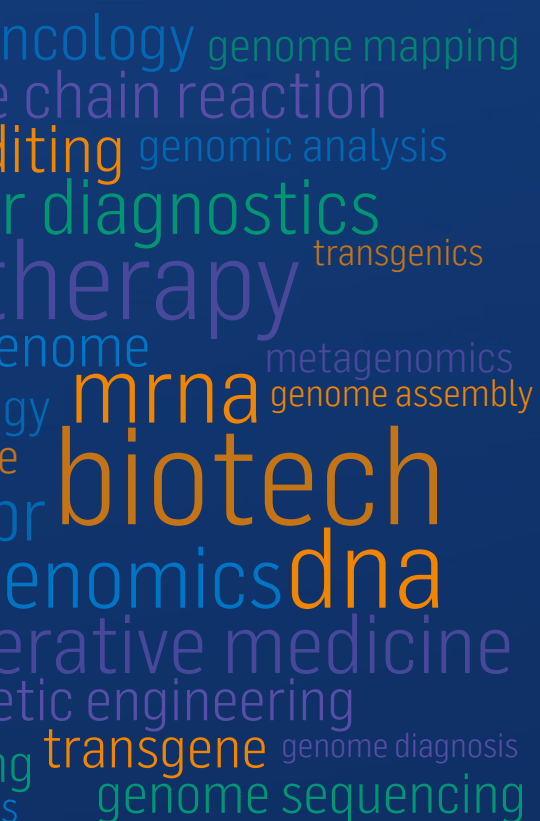
Progress in interdisciplinary sciences is shaping our healthcare system. Innovative technologies ensure efficient diagnostic, surgery, and (post-treatment) monitoring. Major players developing and implementing such technologies are revolutionizing healthcare and will benefit from further industry growth.

BIOTECHNOLOGY

Biotechnology harnesses cellular and biomolecular processes to develop new technologies, drugs, or treatments that save countless lives and improve many more. It is an industry with a noble purpose.

Genomics is the hot topic within the general umbrella of biotech and is poised to revolutionize medicine. Over the last few decades, the field of genomics has advanced faster than any other field of life-sciences. We have already seen the first CRISPR babies born, who are immune to HIV due to gene therapy. We now have one-time injections that cure previously incurable, life-threatening diseases with one shot. We can detect multiple forms of cancer in its early stages, through a simple, non-invasive extraction of blood. Furthermore, costs have decreased spectacularly.



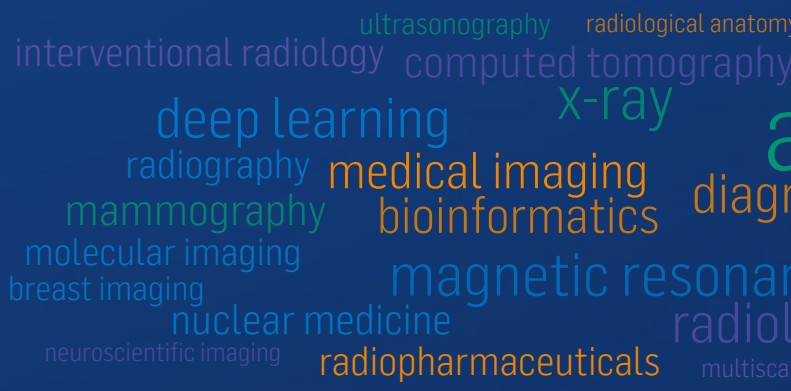


One of the main drivers of growth is increasing government funding, as such innovations will save lives, improve quality of life, and radically reduce costs within the healthcare system. Fortune Business Insights expects the genomics market alone to grow from USD 23 billion in 2020 to USD 95 billion in 2028 (an annual rate of 19.4%)[2].

1) https://www.grandviewresearch.com/industry-analysis/biotechnology-market
2) https://www.fortunebusinessinsights.com/industry-reports/genomics-market-100941#:~:text=The%20market%20is%20projected%20to,all%20regions%20amid%20the%20pandemic.

MEDICAL IMAGING

Referring to the visual representation of the body's internal structures, medical imaging has proven invaluable in diagnosing, treating, and monitoring countless medical conditions. Furthermore, it has the potential to drastically reduce costs and improve profitability over the entire healthcare system, especially through preventive medicine.



The past decade has experienced something of a space race in the medical imaging industry, with companies competing to create more cost-effective, efficient, and less invasive technologies that provide ever-higher resolutions and revolutionize the way we look at healthcare. Furthermore, as pointed out by McKinsey & Company, artificial intelligence and machine learning are now making their way into this industry and have demonstrated potential to drive medical imaging to levels previously unimagined through improved accuracy and speed. There also seems to be rising demand for such services[1], with doctors reporting an ever-increasing number of scans required each year. Despite experiencing a drop during the COVID-19 pandemic, medical imaging is projected to increase at a CAGR in excess of 5% and reach USD 29 billion by 2028 according to Grand View Research[2] and other market researchers with similar views. On the other hand, Definitive Healthcare (a "healthcare commercial intelligence" analytics company) projects artificial intelligence to drive the market to USD 265 billion by the end of the decade[3].

Market size 2030

USD 265bn

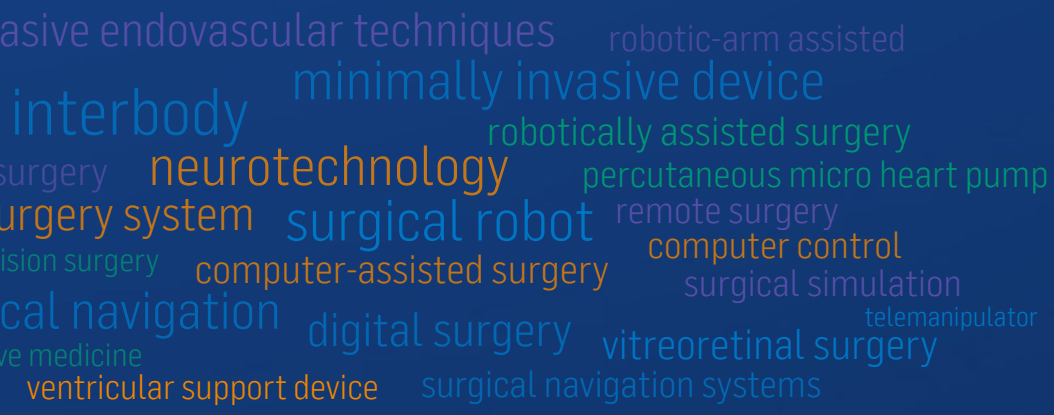
1) https://www.jacr.org/article/S1546-1440(19)30863-4/fulltext; 2)https://www.grandviewresearch.com/press-release/medical-imaging-systems; 3) https://www.definitivehc.com/blog/future-trends-in-medical-imaging-2019

ROBOTIC SURGERY

Robotic surgery is literally transforming the way surgeons operate and the pace at which patients recover. It enables doctors to perform complex procedures with a higher degree of precision and control compared to traditional techniques. In other words, robotic surgery enables minimally invasive surgery, which offers distinct advantages such as smaller cuts and scars, less pain and blood loss, faster healing, and fewer risks of complications like infections.

Robotic surgery market size in 2030[1]

USD 14bn



Robotic surgery has already been rapidly adopted in Europe and the United States. Yet, its implementation is only beginning to accelerate, as more branches of medicine are currently innovating techniques to make use of this technology and its benefits. The demand is already there: patients prefer a two-centimeter incision and doctors favor a less risky procedure. Technological advancements in other fields make it all feasible, and increasing regulatory approvals make it all possible. Finally, several strategic initiatives by top international players in the industry will propel the growth of the market. The global surgical robots market size is expected to grow at a CAGR of around 19% from 2022 to 2030, according to multiple market research providers such as Grand View Research[1], Fortune Business Insights, Verified Market Research, and others[2 3 4].

1) https://www.grandviewresearch.com/industry-analysis/surgical-robot-market; 2) https://www.fortunebusinessinsights.com/industry-reports/surgical-robots-market-100948; 3) https://www.globenewswire.com/news-release/2021/06/28/2254040/0/en/Surgical-Robots-Market-Size-Worth-13-7-Billion-by-2027-at-17-CAGR-Report-by-Market-Research-Future-MRFR.html; 4)

E-HEALTH AND TELEMEDICINE

The COVID-19 pandemic and the resulting need for social distancing have generated a positive demand shock for E-Health or Telemedicine – a practice benefiting both doctor and patient in terms of comfort and convenience, control of infectious diseases, and better assessment and supervision of certain patients. Telemedicine also includes the transmission of medical data between health centers for improving or confirming diagnostics. Furthermore, AI and big data are also starting to play a role, marking the transition towards an analytics-driven healthcare system.

Projected market CAGR[1]

32%

As a result of the sudden demand, this market segment has experienced remarkable growth over the last two years. Yet, strong growth is still expected to continue even after the pandemic is over, driven in part by strong governmental support, as telemedicine can not only improve healthcare coverage in rural or remote areas but also play a major role in preventive medicine due to its convenience aspect.

Therefore, multiple market research reports project this market segment to continue growing rapidly by the end of the decade. According to Fortune Business Insights, the global telemedicine market is expected to grow to USD 636 billion by 2028 at a remarkable CAGR of 32.1% over the forecast period[1]. On the lower end, Markets and Markets estimates a more conservative yet still impressive 26.6% annual compound growth rate until 2027[2].

1) https://www.fortunebusinessinsights.com/industry-reports/telehealth-market-101065
2) https://www.marketsandmarkets.com/Market-Reports/telehealth-market-201868927.html

FUTURE WELLNESS

More than half of all gym members never actually go to their gyms due to lack of time. Given increasing pace of life, more people prefer to work out in their home gyms with a flexible schedule. Mental wellness can also be achieved by meditating and doing yoga with an online coach at home. With the next generation of wearable fitness devices people monitor body feedback and health status in real time during sports or while at rest. Growing connectivity together with advanced sensor technology will enable users to develop a healthy lifestyle in a digitalized world.

HOME GYM AND ONLINE FITNESS

Driven by enhanced connectivity and the emergence of online on-demand coaching, home fitness offerings have become increasingly popular. By overcoming many of the obstacles to exercise, home fitness solutions help to provide a safe, comfortable, and easy to access professional training infrastructure in people's homes.

Online coaching as a subscription based revenue model has also allowed providers to benefit from this trend beyond the pure sales of exercise equipment by generating recurring revenue streams from online memberships and coaching as a service offerings. Apart from body building and staying fit, emotional and mental fitness has also become a priority for many people, as we can observe an increase in yoga and meditation coaching course subscriptions.

According to Research and Markets, the home gym market is projected to reach USD 11.5 billion by 2027, registering a CAGR of 7.8% from 2021 to 2027[1]. Mental health apps market size is even more promising, as Grand View Research gives an estimation of CAGR at 16.5% from 2022 to 2030[2].

Projected market CAGR[2]

16.5%

1) https://www.researchandmarkets.com/reports/5439752/at-home-fitness-equipment-market-by-product-type;
2) https://www.grandviewresearch.com/industry-analysis/mental-health-apps-market-report

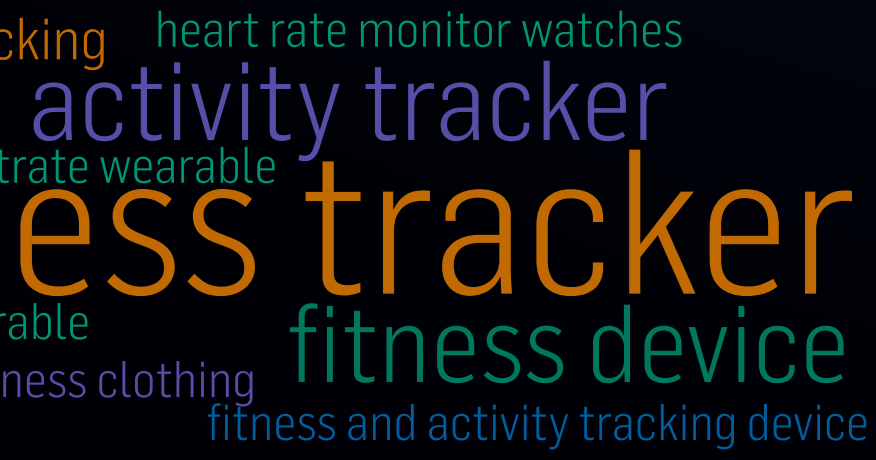
WEARABLES

Another significant innovation is the widely adopted fitness trackers. Costs of electronic sensors have come down significantly, making fitness trackers available to large parts of the world population. Besides the most popular wrist wearables (49% of market share), fitness trackers can also be worn on head, foot or directly on the body. In addition to general fitness tracking, some built-in sensors of wearables can be used to track additional health information such as heart rates, respiratory rates, and blood oxygen saturation levels.

Projected market CAGR[1]

18%

Based on the data collected and respective analytics, users can not only gather sport stats and body feedback, but also begin to predict potential diseases. This opens an entire new field of subscription based or on-demand services to be provided by providers.



The global wearable technology market size is expected to reach USD 74 billion by 2026, with a CAGR of 17.65% from 2021 to 2026, according to Research And Markets[1].

1) https://www.researchandmarkets.com/reports/4591296/wearable-technology-market-growth-trends

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ARTIS®

Solactive's dedicated and skilled team of data scientists and developers work meticulously on a new generation of index development engines, making use of the latest technological infrastructure to apply cutting edge machine learning and natural language processing to a huge amount of data.

The result is Solactive's **Algorithmic Theme Identification System: ARTIS®**.

ARTIS® is Solactive's proprietary natural language processing software that identifies thematic exposures in companies by analyzing more than 500,000 text documents. It functions as a multi-dimensional classification tool that generates a deeper understanding of the products and services a company offers, especially when that company is active in multiple markets and offers various product lines. As such, we use ARTIS® to find companies that are relevant players in the respective theme and use that universe to create indices.

MARKET INTELLIGENCE

We employ our high-end research expertise to identify and define themes

BIG DATA

Huge volumes of financial news and corporate reports are managed

NLP

Company-theme relations are extracted and an investment universe is constructed

The three pillars of ARTIS®

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