Investing in the Fourth Industrial Revolution
HAN-GINS Tech Megatrend Equal Weight UCITS ETF | ITEK
2020

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Overview

The fourth industrial revolution is the current environment where disruptive technology trends such as the Internet of Things (IoT), Robotics, Artificial intelligence (AI), Future Cars/Autonomous Vehicles, Blockchain, Cloud Computing, Genomics and Social Media are changing the way we live and work.

Unlike previous industrial revolutions, these technologies are rapidly combining to create an accelerating, virtuous cycle of nearly unlimited disruption. While previous industrial revolutions were often localized, today's is interconnected and global and its impact is already visible in homes and businesses across the world.

While these technological trends are long-term, the recent Coronavirus pandemic is helping to boost adoption rates across a variety of innovative technologies and highlight their applications.

Coronavirus Reaction Highlights Long-Term Opportunity

With millions of people around the world working from home, key tech trends are being adopted even sooner than analysts expected. From telemedicine and medical wearables to cloud computing and AI/Robotics. The world is changing fast – businesses, hospitals and consumers and commuters are unlikely to go back to pre-COVID19 habits.

Remote working means the need to access information, tools, systems and communicate remotely has never been higher, creating a huge demand for cloud-based technology. Big Tech has benefited from growth of their remote Cloud platforms – particularly leaders in Infrastructure as a Service (IaaS) like Amazon, Microsoft and Google. This growth in remote access has also highlighted the need for enhanced cybersecurity and we have recently witnessed spiking demand for data and privacy protection – boosting cybersecurity stocks. Over 80% of IT managers expect cybersecurity to be their largest spend in 2020 as companies rush to plug vulnerabilities in their systems. ¹

This demand comes from both the public sector (schools, governments, hospitals) and large/small players in the private sector. The likes of Adobe, Salesforce, SAP and Oracle are big beneficiaries of this rollout of cloud’s plumbing. Cloud spending is benefiting at the expense of other IT areas. The flexibility and lower-cost subscription model offered by the cloud – makes it increasingly an easy solution for many corporate IT departments.

In China and Europe, lockdowns are also spurring local players (Alibaba, Baidu and Tencent) to enjoy record online traffic. Baidu and Weibo have both seen a substantial increase in traffic due to the lockdown in China. Other players including Facebook and the Meet Group² have enjoyed record usage – powering stock market gains. Meet Group’s video usage is up 40% and Facebook has reported a 50% increase in messaging and up to 200% increase in video calling since the start of the Coronavirus crisis³.

With traditional models of commuting and public transportation under question, the future car segment powered by Tesla has enjoyed a significant rerating in April. Analysts predict EV vehicle producers are better positioned to weather the current economic decline. Tesla shares have recovered significantly since its March lows – and are approaching recent highs, despite Elon Musk’s protests.

¹https://techwireasia.com/2020/04/as-it-budgets-get-slasheds-cybersecurity-spend-remains-solid/
All Sectors Are Affected

Tangible evidence of the fourth industrial revolution can be seen in most of our households and neighbourhoods: smartphones, electric vehicles, smart TVs, mobile banking apps and virtual assistants; but the change in being felt in almost every sector of the economy.

Manufacturing is becoming faster and more efficient – robotic workers, smart factories and supply chains and deliveries by autonomous vehicles are now a reality.

Transportation and travel is changing with the popularity of electric and hybrid vehicles, and the advent of autonomous cars, trucks and drones.

Artificial Intelligence and Big Data are driven by exponential increases in computer power and are being used to interpret previously unimaginable volumes of information, helping businesses and governments research, discover, plan and react faster and smarter than before.

Digital fabrication technologies are interacting with the biological world on a daily basis. Engineers, designers, and architects are combining computational design, additive manufacturing, materials engineering, 3D printing and synthetic biology to pioneer a symbiosis between microorganisms, our bodies, the products we consume, and even the buildings we inhabit.

Moreover, we are facing a range of new technologies that combine the physical, digital and biological worlds. Advances in AI diagnostics, robotic surgeries, digital implants, customised medicines and gene editing are transforming the way illnesses are managed and even challenging our ideas about what it means to be human.

In line with the race for a medical vaccine and the demand for healthcare solutions, genomics and the field of gene editing has received a large amount of attention. With COVID-19’s genetic code now being known – genomics companies are at the forefront of vaccine research and possible human trials being conducted globally.

Global Trends

The evidence of dramatic change is all around us and it’s happening at exponential speed. Professor Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, is convinced that we are at the beginning of a revolution that is fundamentally changing the way we live, work and relate to one another.

“Prior industrial revolutions liberated humankind from animal power and made mass production possible and brought digital capabilities to billions. This Fourth Industrial Revolution is fundamentally different - characterized by a range of new technologies that are combining the physical, digital and biological worlds. It is impacting all disciplines, economies and industries, and ultimately may even challenge ideas about what it means to be human.”

“

We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before.”
“The possibilities of billions of people connected by mobile devices, with unprecedented processing power, storage capacity, and access to knowledge, are unlimited. And these possibilities will be multiplied by emerging technology breakthroughs in fields such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing.”

**Challenges and Opportunities**

Like the revolutions that preceded it, the fourth industrial revolution has the potential to raise global income levels and improve the quality of life for populations around the world. To date, those who have gained the most from it have been consumers able to afford access to the digital world.

Technology has made possible new products and services that increase the efficiency and pleasure of our personal lives. Ordering a taxi, booking a flight, buying a product, making a payment, listening to music, watching a film, or playing a game—any of these can now be done remotely.

In the future, technological innovation will also lead to a supply-side miracle, with long-term gains in efficiency and productivity. Transportation and communication costs will drop, logistics and global supply chains will become more effective, and the cost of trade will diminish, all of which will open new markets and drive economic growth.

At the same time, the revolution could yield greater inequality, particularly in its potential to disrupt labour markets. There are legitimate concerns that automation will substitute for labour across large areas of the economy. Ultimately there should be a net increase in safe and rewarding jobs and more efficient human society and use of energy.

Many predict that in the future talent, more than capital, will represent the critical factor of production. This will give rise to a job market increasingly segregated into “low-skill/low-pay” and “high-skill/high-pay” segments, which in turn will lead to an increase in social tensions.

The largest beneficiaries of innovation tend to be the providers of intellectual and physical capital—the innovators, shareholders, and investors.

**The Fourth Industrial Revolution**

This whitepaper is a guide to help investors understand the main sectors of the fourth industrial revolution and their features, applications, and growth potential:

- **Robotics & Automation**
- **Genomics**
- **Future Transport**
- **Social Media**
- **Cloud Computing**
- **Blockchain**
- **Cyber Security**
- **Augmented & Virtual Reality**

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Robotics and Automation (Artificial Intelligence)

Robotics is a term for a mechanical device designed to perform an operation or task. These engineering feats are increasingly joined by advancements in software, which allow computers to work, learn, and problem-solve—an area of computer science called artificial intelligence. Together, these technologies are revolutionising the way we complete tasks, analyse data, and make decisions.

For illustrative purposes only
Source: International Federation of Robotics

Recent technological advancements in robotics and artificial intelligence (AI) are disrupting a range of industries from manufacturing, to health care, defence, and transportation.

Robots are fast replacing human workers in a variety of industries and are offering companies massive efficiencies, increased output, 24/7 operations, predictable quality of goods and (in a post-COVID world) less human-to-human interaction when producing goods.

Militaries and emergency services are also likely to be significant players in the robotics and automation industries as drones, exoskeletons and other technologies are increasingly used to replace or augment human troops and emergency workers in dangerous situations.

Few realise just how little human oversight is required of today’s most advanced robots. One Japanese factory has been running in “lights out” mode for more than 15 years, meaning there are no human factory workers. ⁴

Automated plants like this are capable of manufacturing everything from electric razors to even other robots. In addition, breakthroughs in AI allow computers to perform complex tasks by drawing on various data sets and inputs. For example, IBM’s Watson computer is now able to generate sports highlight reels by analysing crowd noises and player gestures. Combining the mechanical abilities of robotics with the intelligence of AI has resulted in machines capable of cleaning, cooking, driving, and caretaking among other human-like tasks.

Once unleashed, this technology is impossible to put back in the box and robot/AI combinations are posed to replace many repetitive, dangerous and menial tasks in industry and our day to day lives.

Robotic Solutions to Human Problems

Robotics and AI are of such interest as they help address a host of problems resulting from an aging population, rising labour costs, and quality improvement needs.

**Aging Populations** – Fewer people to produce goods & services, more economic dependents, increased healthcare needs

**Labour Costs** - high labour costs can be reduced by robots (cheaper than offshoring). Wages in China and EM are getting more expensive.

**Performance Improvements** – robots more precise and faster than humans = less wastage, higher output and better quality.

Robots and AI are drivers of improved productivity. Engaging these technologies can yield faster, higher quality outputs without cognitive and physical problems. The adoption of robotics in places like Germany, South Korea, China, Japan, and the U.S. is expected to boost productivity by up to 30% by just 2025.5

Part of the reason for the sudden surge of robotics and automation in manufacturing lies in the skill gap. According to a survey conducted by Deloitte and the Manufacturing Institute,6 up to 2 million manufacturing jobs will be left unfilled over the next decade due to improperly trained talent or a lack of individuals interested in careers in the manufacturing space.

Labour costs are expensive and rising, which is a particularly challenging prospect for competitive industries like manufacturing. While offshoring helps, many companies are finding robots to be even more cost efficient. One analysis found that offshoring jobs could save a firm approximately 65% on labour costs while replacing workers with robots can achieve an estimated 90% in savings.7

**Industrial Robots - Estimated Worldwide Supply**

For illustrative purposes only  
*Source: IFR World Robotics*


In healthcare, robots are also revolutionising the speed, accuracy and efficiency of healthcare services. IBM Watson’s supercomputer has 90% diagnostic accuracy already for lung cancer vs 50% physicians. In healthcare, robots are also revolutionising the speed, accuracy and efficiency of healthcare services. (IBM Watson’s supercomputer has 90% diagnostic accuracy already for lung cancer vs 50% physicians. Over 5,000 Da Vinci surgical robots in hospitals around the world helped perform over 1 million operations (Intuitive Surgical corporate website press release 2018 4th qtr)). With ageing populations, the demand for fast and accurate diagnosis, coupled with modern treatments for a variety of diseases and illnesses is likely to increase along with the demand for healthcare trackers, robotic nursing assistants, robotic surgeons and new medical devices.

The recent COVID-19 outbreak highlighted how robots can be used in situations that would be dangerous or inefficient for humans:

**Reported Use of Robots (Ground, Aerial) Worldwide for COVID-19 as of 20 April 2020**

- **Public Safety, Public Works, Non-Clinical Public Health**
- **Clinical Care**
- **Work, Critical Infrastructure, Quality of Life**
- **Laboratory and Supply Chain Automation**
- **Non-Hospital Care**

- **Delivery**
- **Delivery to quarantined**
- **Quarantine or nursing home socializing**
- **Off-Site Testing**
- **Testing and care in nursing homes**

**Source:** R. Murphy, V. Ganduli, Texas A&M; J. Adams, Centre for Robot-Assisted Search and Rescue, CC BY-ND

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Artificial Intelligence

Artificial intelligence is already with us in the form of digital assistants (Hey, Siri...) and self-driving cars, but the power of computers to learn and problem-solve has applications for every industry. Analysts predicting that the robot and AI market will exceed $150 billion this year (2020). 8

The industries that are at the forefront of this adoption include:

**Manufacturing:** Factories will increasingly use industrial robots that are falling in price. Supply chains increasingly managed by smart order systems and inventory management.

**Military and Defence:** Drones, autonomous weapons, threat analysis, intelligence gathering

**Medicine:** Biotech and genomics, remote GPs, health trackers, AI diagnostics and custom medicines. For example, IBM’s Watson supercomputer can diagnose lung cancer with a 90% accuracy rate compared to 50% by humans.

**Transportation:** Autonomous cars are already appearing on streets. By 2030 autonomous cars could account for up to 15% of passenger vehicles sold worldwide. 9

**Agriculture:** New ways to analyse soil, irrigation, and crop yields, robotic harvesting and smart greenhouses / barns

**Finance:** The financial sector is at the fore of advancements in AI as Financial Technology (FinTech) such as the introduction of robo-advisors which can create and maintain customised portfolios for investors.

We are only scratching the surface of what AI can deliver. Artificial intelligence could contribute an additional 1.2 percent to annual gross domestic product growth for at least the next decade - equivalent to $13 trillion in additional global economic activity by 2030.10

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Future Transportation

Horses were first domesticated around 6,000 BC and the wheel was invented sometime around, 4,500 BC. Even though it took humanity nearly 1,500 years to create the first horse-drawn wheeled vehicle, we’re now making huge developments in transportation technology that enable us to travel further and faster than ever before and in incredibly imaginative ways.

We already have e-scooters, personal submarines, functional jetpacks, wingsuits and electric planes; and sci-fi scenarios like self-driving cars, trucks and robo-taxis operating in smart cities may be coming to your neighbourhood in future.

Autonomous vehicles use artificial intelligence, software, RADAR and LIDAR technology to monitor a 360 range around the car to form a dynamic 3D picture of the environment. By combining sensors, software and controls, the vehicle can navigate, drive and respond to the actions of other road users without the need for human input.

Future transportation is a key theme of the fourth industrial revolution and encompasses a range of new technologies that are making it faster, cleaner, smarter and safer to move goods and people about.

The inter-connectedness of the fourth industrial revolution is well illustrated by advances in the future transportation sector. Along with the development of advanced battery technologies, advances in areas such as robotics (manufacturing of vehicles, autonomous driving systems) cloud computing (design, security, smart cities, driver assistance systems, mapping, AI, ride-share platforms and network connected services for transportation) and cyber security (prevent hacking of transport systems, theft of vehicles) are helping to push the industry forwards.

While electric and hybrid vehicles are the most visible indication of how rapidly new transportation technologies are being adopted, the industry is multi-faceted and includes manufacturers of hybrid, electric and autonomous (self-driving) cars, trucks, planes, boats, e-scooters and delivery drones, as well as battery and fuel cell producers, high speed and wireless charging technologies, raw material suppliers, sensor manufacturers and technology hardware and software providers.

In combination, these companies are helping to create a new transportation paradigm that is forcing change across industries and businesses— one where low polluting vehicles can safely navigate to a location with minimal human input, reducing or eliminating the need for human drivers, speeding up delivery and travel times, reducing congestion and lowering costs.
As the industry evolves, it has the potential to fundamentally reshape road usage and vehicle ownership; changing the way that urban spaces are conceived and how cities are designed. With the majority of the world now living in urban areas, new approaches to transportation’s effect on both humanity and industry have the potential to be massive and profound.

**Hybrid & Electric Vehicles**

The investment opportunity of the electric and hybrid vehicle market is well illustrated by the fact that, by market cap, Tesla is the now the second largest car company in the world. With a market cap of 150Bn (20th May), Tesla is larger than General Motors (35.3Bn), Honda (43.5Bn), Ford (21.1Bn), Daimler (36.2Bn) and Harley Davidson (3.3Bn) combined. Only Toyota, at 195.5Bn is larger.11

Overall, the global electric vehicle market is projected to reach $802.81 billion by 2027, registering a CAGR of 22.6%12, with continued growth in the sector spurred by developments in battery technology and the direction of government environmental and urban planning policies.

Cheaper and better-quality batteries are increasing use by auto companies and driving down the cost to the end consumer. The cost of Lithium batteries used in electric vehicles fell 87% from 2010 to 201913 and new combinations of chemistry, design and technology mean the next generation of batteries will offer longer ranges, fewer and faster recharges, wireless recharging and increased output.

Lower cost batteries mean more car and truck manufacturers are creating electric and hybrid models – an estimated 500 different electric vehicle models will be on the market by 2022, meaning more competition, lower prices, and broadened appeal across different consumer segments.

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**Top US EV car sales (2019)**

![Graph showing top US EV car sales (2019)](image)


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12 [https://www.alliedmarketresearch.com/electric-vehicle-market](https://www.alliedmarketresearch.com/electric-vehicle-market)


14 [https://about.bnef.com/electric-vehicle-outlook/](https://about.bnef.com/electric-vehicle-outlook/)
Governments are also imposing increasingly stringent environmental guidelines for vehicle manufacturers in a bid to combat emissions and meet CO2 targets and reduce congestion, further spurring the development and adoption of a wider range of electric and autonomous vehicles.

Electric taxis, buses, mopeds, scooters and bikes are already commonplace in in many cities. Large fleets owned by delivery companies and couriers are incentivised to ‘electrify’ their fleet by the imposition of variable emission charges in urban areas.

Huge vehicle fleets owned by public transport operators are also electrifying. For example, London owner of Europe’s largest electric bus fleet of 200 vehicles, plans to add a further 78 electric buses in 2020. The city’s entire fleet of 9,000 vehicles is planned to transition to hybrid or electric by 2037.

As cities seek to reduce congestion, many are looking at the feasibility of fleets of self-driving taxis and ride-sharing vehicles to replace private transport and free-up space previously used for on and off-street parking.

**Market Growth & Summary**

Electric and hybrid vehicles still represent only a small portion of the overall automotive market – about 2.7% of all sales in 2020. Nonetheless, growth is significant, with sales surging from 450,000 vehicles in 2015 to 2.1 million in 2019. This growth trajectory is expected to continue with as many as 54 million vehicles, or 58% of the total market being electric or hybrid in the next 20 years.

In 2019, Europe and Asia represented ~75% of the total electric and hybrid vehicle markets and are expected to be significant drivers of future demand.

The market for autonomous vehicles is still in its infancy, with an estimated value of $54.23 billion in 2019, it is projected to garner $556.67 billion by 2026, registering a CAGR of 39.47%.

Autonomous cars by 2030 could account for up to 15% of all passenger vehicles sold globally, according to Global Industry Analysts, Inc.

As such, the future transportation sector is positioned to play a significant role in the future economy and is an attractive option for investors looking to enter an industry at an early stage of development.

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15 [https://www.intelligenttransport.com/transport-news/87086/the-london-electric-bus-fleet-is-the-largest-in-europe/](https://www.intelligenttransport.com/transport-news/87086/the-london-electric-bus-fleet-is-the-largest-in-europe/)
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Cloud Computing

Cloud computing refers to a wide range of computing infrastructure, platforms, security services and software which are delivered over the internet and that can be accessed remotely and on-demand.

Cloud underpins a massive amount of businesses – everything from Gmail, Netflix, Facebook, almost any app on your smartphone to services that enable large organisations to host all their data and applications, to ecommerce providers – all are reliant on the cloud to continue to operate.

Cloud has seen rapid adoption at the enterprise level as companies seek to build a robust IT infrastructure without the risks and costs of maintaining, staffing and upgrading it themselves. Instead of owning their own IT infrastructure, companies can hire or license services and applications from cloud providers.

Cloud companies are often grouped in “X-as-a-Service” categories, depending on what they provide.

**Software as a Service (SaaS):** Software as a Service providers host and manage the software application and underlying infrastructure and handle any maintenance, such as software upgrades and security patching, e.g. Gmail, Adobe, Netflix, Salesforce, Workday, Zoom

**Platform as a Service (PaaS):** Software development platforms delivered over the internet.

**Infrastructure as a Service (IaaS):** a way of delivering cloud computing infrastructure – servers, storage, network, and operating systems – as an on-demand service.
Cloud technology can be either public or private. Public clouds are operated by third parties such as Amazon Web Services whereas private clouds are operated by a single organisation for the benefit of their geographically diverse business. Hybrid clouds are custom combinations of the two.

Cloud Market Demand Drivers
From data storage to accounting and HR systems, website hosting or e-commerce infrastructure; cloud-based services have seen early adoption on a massive scale as they have offered:

✓ **Significant cost savings:** compared to owning, maintaining, upgrading and staffing own internal IT systems
✓ **Greater speed and flexibility:** employees can now access necessary tools and data from any location, changing how and where businesses can operate. A key feature in an age where remote working is increasing
✓ **Reliability:** cloud computing makes data backup, disaster recovery and business continuity easier and less expensive
✓ **Productivity:** Lack of on-site hardware reduces the need for IT support
✓ **Scalability:** Cloud solutions can expand and be deployed quickly to meet a company’s changing needs

We are only seeing the tip of the iceberg for cloud usage – requirements for data storage, hosting, access-anywhere applications and secure mobile services are expected to surge as billions of Internet of Things devices are connected, as emerging market internet usage grows and as remote working styles proliferate.
Data Storage  The need to store data has never been greater and has never grown faster. In 2018, it’s estimated that 2.5 Quintillion bytes of data were created every day. By 2025, this is expected to grow to a mind-shattering 483 Quintillion bytes of data every day.\(^2\)

483,000,000,000,000,000 bytes a day

The advent of AI, Big Data and machine learning could potentially push this number even higher. Storing this data remotely and securely is a critical challenge that cloud can address.

IoT  Up to 64 Billion Internet-of-Things devices could be connected by 2026\(^2\) - smart phones, connected appliances, medical wearables, smart cars, home assistants, smart watches, internet connected home security systems and locks are examples we already see around us.

Ecommerce  Ecommerce providers rely heavily on the efficiencies, scalability and automation that cloud-based computing can bring. Websites, mobile apps, payment systems, order systems, logistics, fulfilments and many other critical services need cloud to function. It’s perhaps no surprise that two of the largest ecommerce providers, Amazon and Alibaba are also leaders in cloud infrastructure. (See on next page)

Growth Businesses  As cloud offers scalability, reduced costs and flexible access, it has seen rapid adoption among small and medium sized businesses, as well as by entrepreneurs in emerging markets. Businesses can now access a tremendous variety of online services at a low-cost such as mobile banking, payment systems, email, social media, HR systems, finance systems and website hosting. This is enabling them to ‘leapfrog’ traditional models and grow using secure, low-cost, modern, cloud-based solutions – often with ecommerce models.

This change is highlighted in the Flexera Cloud Market Report 2020\(^3\) which polled 750 organisations between 100-10,000 employees. The report found that by 2021, an estimated 70% of small and medium sized businesses data and workloads will be in the cloud – far higher than the overall average of 58%.

It is now entirely possible to create a company with no physical location, offering web-based products or services, with most of not all functions (accounting, marketing, sales, legal, management, design) taking place remotely using online tools to help the team coordinate.

In this respect cloud technology is helping to create a new type of business that floats above us invisibly, which in turn drive new demand for additional cloud services.

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Remote Working

The response to COVID-19 saw a huge rise demand from companies using cloud-based solutions to help their employees effectively transition to remote working. From remote system or database access to email, videoconferencing and workflow tools, cloud has enabled many businesses (including HANetf) to continue to operate continuously and effectively throughout the crisis.

With remote working seemingly set to be a more normalised feature of tomorrow's world, the need for cloud-based solutions is set to grow with 59% of respondents in the Frontera report saying that COVID-19 will directly increase their cloud usage.

Key Players in the Cloud Market

The main players in the provision of public cloud infrastructure are large technology and ecommerce providers; with Amazon clearly leading the way with 33% of the market share.

Amazon Leads $100bn Cloud Market

For illustrative purposes only

Source: Synergy Research Group. Data as of Q4 2019. Data includes PaaS infrastructure as a service as well as hosted private cloud services

Growth of the Cloud Market

The strong tailwinds propelling the cloud market alongside its critical infrastructure-like role in the modern digital economy has created a great deal of investor interest in the sector. Spending on cloud already accounts for a large proportion of corporate IT budgets and this is expected to continue to increase - respondents to the Flexera survey\(^\text{24}\) expected an average 47% rise in cloud spending this year.

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<thead>
<tr>
<th>Annual Cloud Spend $</th>
<th>% Respondents</th>
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<tr>
<td>More than $12 Million</td>
<td>20%</td>
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<tr>
<td>$2.4m - $12 Million</td>
<td>36%</td>
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<tr>
<td>$1.2 - $2.4 Million</td>
<td>18%</td>
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<tr>
<td>$600k - $1.2 Million</td>
<td>13%</td>
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\(^{24}\)https://www.flexera.com/blog/industry-trends/2020/05/trend-of-cloud-computing-2020/
Predictions for the growth of the global cloud industry show a similar trajectory with Gartner suggesting 17% revenue growth for cloud companies in 2020-2021 period. Other analysts suggest that by 2027, the cloud market could be worth as much as $927 Billion – nearly four times its current size.

**Worldwide Public Cloud Service Revenue Forecast $US bn**

For illustrative purposes only

Source: Gartner 2019

**Cyber Security Theme**

The cybercrime threat is often identified by CEOs as the leading risk factor facing enterprises today. As companies grow increasingly reliant on cloud-based software and as billions of new internet-connected devices are launched (Internet-of-Things), the scope for malicious cyber activity is increasing exponentially.

Cybercrime includes:

- **Hacking** - shutting down or misusing websites and computer networks,
- **Identity theft/ phishing** - using fake email messages to get sensitive information from users
- **Malware /ransomware attacks** - inserting malicious code to damage a computer system, surveillance and eavesdropping or electronic money laundering.

While an estimated 75% of cyber-crime is carried out for financial gain, up to 25% is put down to state-sponsored espionage.

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With military and police services introducing more robotic technologies, drones and autonomous vehicles; cyber security is transitioning from being a commercial to a national security concern for many governments.

The scale of the issue is already huge: data breaches are estimated to have compromised 4.1 Billion records in the first half of 2019 - up 11% year-on-year and cyber-crime is predicted to cost the global economy an astonishing $6 Trillion a year by 2021.

With the average data breach costing a company $3.9 million, mitigating the risk of cybercrime is a top priority for business leaders.

**Recent Examples:**

- In 2016, 3 billion Yahoo! accounts were hacked in one of the largest data breaches in history
- In 2016, Uber reported that hackers stole the information of over 57 million drivers and riders
- In 2017, 148 million consumers were affected by the Equifax breach
- In 2018 Under Amor reported its fitness app was hacked, impacting 150 million users
- In 2018 Marriott Hotels reported that up to 500 million guests had details compromised, including credit cards details and passport numbers
- In 2020, the Australian Defence Force was itself forced offline for 10 days as it responded to data breach that exposed personal details of tens of thousands of its members
- It is estimated that in March 2020 alone, 832 million digital records were breached worldwide.

**Growth of the Cyber Security Sector**

It has become imperative for organisations and individuals to protect themselves against the widespread economic, operational and reputational damages caused by cyber-attacks and investment in cyber security measures is becoming one of the largest spends in IT departments around the world.

In 2020 size of the cyber security market is estimated to be $173 Billion. While analyst estimates vary, there is broad consensus that the industry will continue to benefit from huge tailwinds, reaching anywhere between $250 Billion and $1 Trillion per year by 2025.

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27 [https://www.varonis.com/blog/cybersecurity-statistics/](https://www.varonis.com/blog/cybersecurity-statistics/)
30 [https://cybersecurityventures.com/cybersecurity-market-report/](https://cybersecurityventures.com/cybersecurity-market-report/)
Global Cybersecurity Market Forecast (US$bn)

For illustrative purposes only
Source: Statista 2020

As ransomware hits more companies, malware becomes refocussed on mobile and smartphones and billions of Internet-of-Things devices connect, the scope for the cyber security market to grow seems assured and 62% of companies plan to increase cyber security spend this year.\(^{31}\)

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Genomics Theme

From William Harvey and the human circulatory system, to Alexander Fleming and the discovery of penicillin to the first heart transplant; medical advances have gone hand-in-hand with a better understanding of the human body.

Medicine has come a long way in the 70 years since the first correct double-helix model of DNA was produced at Cambridge University in 1953, and the dawning age of healthcare sees a confluence of medicine and technology that offers the potential to fundamentally alter how we are diagnosed, treated and supported through illness.

Understand an individuals’ genetic make-up can help determine their predisposition toward certain diseases. guide the best course of treatment and contribute to new therapies for specific diseases (precision medicine).

Almost all human illnesses have some genetic basis, but it is only recently that doctors have been able to take genetics into consideration when diagnosing or treating their patients. It is even more recently that doctors have been able to tailor treatments based on a patient’s unique genetic make-up, or provide treatment for diseases at the genetic level.

A genome is the full genetic make-up of an individual. In 2003, The Human Genome Project – an international scientific effort to map the entire human genome – was completed at a cost estimated at over $500 million. Since then, the cost of genome sequencing has fallen to under $1,000, making it cheap enough for researchers and doctors to obtain large amounts of genetic data from a wide range of individuals.

For Illustrative purposes only

Source: National Human Genome Research Institute

A broader and more accessible research data set has accelerated scientific understanding of the effect that (combinations of) genes play in contributing to diseases that impact large swathes of the population – diseases like cancer, diabetes and cardiovascular disease, along side other hereditable illnesses.

These advances opened the door to a new age of gene therapies and genetic editing technologies like CRISPR, whereby genetic abnormalities can be corrected by administering new DNA, or by editing out and replacing faulty sections of the patient’s DNA.

These remarkable new capabilities extend into both veterinary and agricultural areas with GM plants being a well-known example of a practical application for genetic research.

To capture these developments, the Genomics theme in ITEK focuses on companies that incorporate technological and scientific advancements in genomics into their business, including

- **CRISPR** (genome editing tool)

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32 [https://www.genome.gov/about-genomics/fact-sheets/Sequencing-Human-Genome-cost](https://www.genome.gov/about-genomics/fact-sheets/Sequencing-Human-Genome-cost)
Megatrends Driving the Genomics Market

The growth of the genomics market is expected to be driven by the healthcare and agricultural sectors as they respond to new challenges caused by long-term social and technological megatrends:

- **Technology**: Increasing computing power was critical in driving down the cost of DNA sequencing, providing the foundation for modern genetic research. Advances in Genomics have since been supported and accelerated by bioinformatic data sets that aggregate and analyse information from multiple sources, cloud-based research portals, machine learning, gene editing tools and new visualisation technologies.

- **Ageing populations**: continued advances in medicine mean that people are living longer and while they face declining risk of dying of communicable diseases, the risk of dying of illnesses with a genetic component such as heart disease or cancer is on the rise. Governments are seeking to reduce the economic cost off illness by funding new genomic research such as the UK’s £300 million ‘100,000 Genome’ project. Genomics also has significant potential in the provision of personalised medicines, whereby treatment is customised according to each individual’s unique genetic profile. Research in this area increasingly combines big data sets, machine-learning and AI to uncover previously unseen patterns in DNA that may yield new understanding of an individual’s susceptibility to various diseases. Individualised healthcare can lead to healthier patients, longer lives and a more productive existence.

- **Food Security**: As human populations continue to grow and arable land becomes scarcer, the world is facing a significant food security challenge. Genomics may have a role to play in addressing this by helping to modify food crops to produce higher yields, be more disease and pest resistant or grow in different climates.

Against this backdrop, the Genomics market is expected to be a high-growth healthcare theme. In 2019, the market was estimated to be $19 Billion and is expected to grow to $39.7 Billion by 2024 - a CAGR of ~13.5%.  

Genome-based research is already enabling medical researchers to develop improved diagnostics, more effective therapeutic strategies, evidence-based approaches for demonstrating clinical efficacy, and better decision-making tools for patients and providers.

Social Media

It is not a controversial statement to say that the internet is the defining technology of our age. Billions of people are now connected to the internet and are able to access and share a previously unthinkable amount of information, media and entertainment. An estimated 4.6 Billion people, over half of the world’s population, now has internet access.

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34 https://www.marketsandmarkets.com/Market-Reports/genomics-market-613.html
The internet age has also profoundly changed the way that media is created and disseminated. Instead of a small group of media companies controlling the debate, now anyone can contribute to and influence the global conversation through a proliferation of social media platforms.

Social media takes many forms, including blogs, chatrooms, forums, photo and video sharing, social gaming, chat apps as well as the familiar social networks like Facebook or LinkedIn and its popularity is such that there are an estimated 3 Billion active social media users. If you have an internet connection, it’s very likely you will also have social media. As lower cost, more accessible mobile broadband is rolled out across the developing world, the potential to bring many more people online and, in turn, create more social media users is very high.


As illustrated above, there are many names (Facebook, YouTube...) in the top social media platforms that are familiar to many readers but platforms that face emerging market users (China, India) are also significant players. While they may be less well-known, they command massive user bases and are growing fast.

**Social Media – Benefiting From Huge Advertising Disruption**

The basic business model for social media is the same as for any other media platform: advertising. The larger the audience, the more effective an advertising platform it will be. The more time people spend on

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social media, the more impact advertising can have and the more engaged social media users means advertisers gain confidence that their money is being deployed effectively.

The huge success of social media in attracting advertising spend reflects the seismic shift occurring in the way the average person consumes media content.

Historically, TV and Radio have been the primary opinion-shaping media, taking the greatest share of mind of the audience. Yet now, for the first time, audiences are spending more time looking at their mobile phones than TVs. This profound change in consumer behaviour, information dissemination and use of leisure time has significant knock on effects for advertisers who must now develop new strategies to deliver effective, impactful content and messages.

![Average Time Spent Per Day (Minutes)](chart)

*Source: https://www.emarketer.com/content/mobile-soon-to-pass-tv-in-time-spent*

**The Digital Disruption of Advertising**

In an increasingly fragmented media landscape, traditional advertising strategies are no longer cost effective. As consumers spend more time on mobile devices and less time on newspapers, magazines and TV, marketing managers must develop new strategies to deliver their message. With user bases that dwarf the audiences of even the most successful prime-time TV shows, social platforms offer a more compelling proposition to advertisers that want cost effective targeting.
Some see a zombie apocalypse, others see an advertising opportunity

This evolution in the viewing habits of consumers has catalysed a profound change in advertising buying patterns. While most traditional advertising mediums have been in long-term secular decline, digital advertising spend has rapidly accelerated. In 2016 the ad industry became digital-first - more advertising dollars were spent online than on TV, or any other form of media. In total, online ad spending grew from ~$48.4bn in 2008 to ~$227bn in 2018 and is estimated to reach ~$274bn this year (2020).

Global Ad Spending by Medium, $Billions 2000-2020

For illustrative purposes only


Social media advertising, as a subset of internet advertising reflects these broader trends. In the UK, Europe’s largest digital advertising market, two-thirds of all advertising budgets are now deployed online,
and a quarter of that is deployed on social media. In the UK social media advertising is predicted to even eclipse TV ad spend by 2020, taking an estimated 30% share of all advertising budgets. This is a phenomenal land grab by social platforms, most of which did not exist 15 years ago.

**UK Digital Ad Spend £Billions 2018-2022**

<table>
<thead>
<tr>
<th>Year</th>
<th>Digital Ad Spend £bn</th>
<th>% of Total Ad Spend</th>
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<td>2018</td>
<td>63.9</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>66</td>
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</tr>
<tr>
<td>2020</td>
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<tr>
<td>2021</td>
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<tr>
<td>2022</td>
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</table>

Source: https://www.emarketer.com/content/more-than-60-of-uk-media-ad-spending-is-digital

For illustrative purposes only

**TOTAL POPULATION**
- 7.593 Billion
- Urbanisation: 55%

**INTERNET USERS**
- 4.021 Billion
- Penetration: 53%

**ACTIVE SOCIAL MEDIA USERS**
- 3.196 Billion
- Penetration: 42%

**UNIQUE MOBILE USERS**
- 5.135 Billion
- Penetration: 68%

**ACTIVE MOBILE SOCIAL USERS**
- 2.958 Billion
- Penetration: 39%

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Blockchain

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Many people will have first heard about Blockchain through its association with Bitcoin, but its applications go far beyond cryptocurrencies as it stands ready to create huge efficiencies across almost every industry vertical.

At its simplest, a Blockchain is a decentralised list of records (blocks) that are linked by cryptography. Each block contains a cryptographic record of the previous block in the chain, a timestamp and transaction data. A verified transaction can include financial, contracts, legal records or other information. Once verified, this new block is then added to the existing blockchain.

Any additions to the Blockchain must be validated by a majority of users, and a block cannot be altered once added, making it highly secure, hard to tamper with and fast.

While the world of record-keeping conjures up images of musty, leather-bound tomes, rooms of filing cabinets or cavernous archives, it is the near universal need to record, validate and store information securely that is providing real-world applications for Blockchain and generating increased investment interest in the sector.

**Why Blockchain is Useful**

Security, tamper-resistance and speed are the qualities that give Blockchain the potential to offer huge efficiencies for any organisation or institution that needs to keep records or transfer sensitive information securely; such as money transfers, medical records, contracts, shareholder information, trade details or a vote.

Financial services is the sector that has most rapidly embraced Blockchain, representing about 60% of spending. This is perhaps unsurprising given the importance of transactional data for their business, but Blockchain stands to impact a wide array of industries.

A recent Deloitte survey\(^3\) polled nearly 1,400 executives from around the world on their perceptions of, and use of Blockchain. 53% reported that Blockchain has become a critical strategic priority for their company, with 71% citing improved security as it’s key appeal. Of those polled, 40% are spending more than $5 million a year or R&D or implementation.

An amazing 86% reported that Blockchain could be a source of growth for their business in future, indicating that Blockchain is not simply about creating efficiencies in existing processes, but driving the creation of entirely new revenue streams and business lines. This is a clear indication of the interconnectedness of the fourth industrial revolution where advances in one area, in this case Blockchain, can help propel advances in other sectors and industries.

With small and medium size companies increasingly adopting shared and private Blockchain solutions, it is likely to play a significant role supporting the innovators and disruptors of the fourth industrial revolution.

The full scope of Blockchain’s potential remains uncovered, but Blockchain stands to confer significant benefits to a variety of sectors over the shorter term, including:

**Digital IDs and Passports:** Reduce bureaucracy and ID fraud

**Voting Systems:** Prevention of voter fraud or manipulation of e-voting results

**Healthcare:** Use of blockchain technology could allow hospitals, doctors and other parties in healthcare provision to share access to data securely and confidentially. This could result in faster and more accurate diagnosis and more cost-effective treatment.

Cybersecurity: The immutability of the Blockchain can help prevent hacking, theft or fraud and, by removing human intermediaries, Blockchain reduces the risk of hacking or human error.

Cloud Technology: Increased security during a shift from centralised to decentralised cloud-based digital solutions

Real Estate: Track titles, deeds and help ensure documents are accurate and verifiable. Speed up and simplify the process of buying and selling properties

Smart Contracts: One of the most exciting applications for Blockchain, smart contracts automatically create, monitor and execute legal contracts, providing a more secure, more automated alternative to traditional contract law.

Finance and Banks: Faster cheaper and more secure transactions and settlements.

Ecommerce: Lower transaction cost and heightened security

Supply Chain Management: Supply chains are essentially a series of transaction between parties moving goods. Blockchain enables secure and transparent tracking of supply chains - as products change hands move through the supply chain, the transactions can be recorded in a permanent decentralized ledger — reducing time delays, added costs, and human errors.

Digital Currencies: Bitcoin and other alternative digital currencies

The real-world applications of Blockchain are rapidly extending beyond cryptocurrencies as heightened awareness of different uses grows and more R&D dollars are directed towards the technology.

Industry Trends and Growth

In some ways, blockchain’s long association with cryptocurrencies made it difficult for business leaders to see real-world usage for the technology, but now a change in sentiment is occurring as the applications of blockchain become better understood and the technology becomes cheaper and more accessible.

Companies in almost every sector are investing in the technology and human capital needed to implement their own solutions, and many are creating their own private blockchains to serve specific purposes.

Against this background, worldwide spending on blockchain solutions is expected to grow from $1.5 billion in 2018 to reach $23.5 billion by 2030 39, a CAGR of 48.7%. Some analysts40 predict an ever higher CAGR of 69.4%, making Blockchain one of the highest growth-potential segments of the fourth industrial revolution.

Augmented & Virtual Reality

Virtual reality is a combination of imaging, hologram, motion sensing, 3D technologies and feedback

40 https://www.grandviewresearch.com/industry-analysis/blockchain-technology-market
technologies that enables us to experience artificial or remote environments as if we were there. Augmented reality overlays data and information on top of our existing senses to add information to enhance decision making.

TV and movie buffs will remember the Starship Enterprise has a room called ‘The Holodeck’ where any reality or scenario could be created and which the characters could interact with the illusion. In ‘The Matrix’, the whole of humanity is plugged into an artificial world (this one) while a race of aliens harvests their bodies’ energy. Both were examples of a ‘virtual reality’.

Virtual reality has long been a sci-fi trope, but is now emerging into the mainstream. On the most basic level, you can now buy a simple headset for under $10 that will allow you to experience immersive 360-degree environments via your cell phone (search ‘360 video’ on YouTube for hundreds of examples) but VR and AR technologies are being adopted across industries to improve training and education, create new forms of entertainment and deliver critical real-time information to surgeons, soldiers, pilots and designers.

**Some Applications and Examples**

**Entertainment:** One of the biggest applications for VR/AR is in the entertainment industry. Anyone with a smart phone can now experience virtual 360-degree concerts and movies, however, the real opportunity is in video games. Currently the gaming industry is the single largest entertainment sector, with annual revenues of about $140 Billion[4]. Gaming dwarves the music industry ($19 Billion[5]) and comfortably exceeds total annual box office and home entertainment movie revenues ($136 Billion).

Virtual reality takes the gaming experience to the next level, offering photo-realistic 3D graphics, immersive, responsive virtual environments, motion capture, gesture capture and haptic feedback. With every advance, the Enterprise’s Holodeck edges closer to being a reality and with an estimated 2.5 billion gamers[6] around the world, the addressable market for even more exciting gaming experiences is massive.

**Healthcare Virtual reality** is being introduced for practical reasons in the medical sector, enabling doctors and surgeons to practise in realistic but harm-free environments, simulate emergencies and enhance the quality of post-operative care.

VR is also being used for **patient education** — by enabling patients to take a virtual ‘tour’ through their own bodies, they can better understand their illness and how it will be treated. This helps demystify complex medical processes and provides reassurance for patients.

**Architecture:** VR technologies have a significant application in the architecture and design industries. Architects can give clients virtual tours of buildings, towns or developments before the first shovel of soil has been moved, allowing them understand key features and make any changes. This also extends into the real-estate industry where prospective buyers can get a 360-degree tour of multiple properties from the comfort of their sofa.

**Military** VR is well suited to enhancing training for difficult and dangerous roles. As such, militaries have been early adopters as it can be used to provide learners with a virtual environment where they can develop their skills without the real-world consequences of failing.

It has been used in bomb diffusion, astronaut training, flight simulators, driver training and medical training. Supplementing general military training with virtual training environments has also been popular as training costs can be reduced by minimizing the amounts of ammunition expended during training periods.

Similarly, Augmented Reality is being incorporated into next-generation military vehicles and helmets. HUD’s (heads-up displays) project real-time information on a visor or windshield. For example, it may be used so teammates can know where each other is in real-time or the location of evacuation points or directions to a target.

The US army tested its first augmented reality system in 2019. Called HUD 3.0, the system enables soldiers to know where they are, where their unit is and where the enemy is, allowing them to quickly adjust battle plans in a real-time environment.

Military HUDs provide critical real-time information to troops. Source US Army.

These advances are also leaking into the civilian world with numerous cars now providing similar heads up displays that enable the driver to concentrate on the road instead of looking at dials or sat navs.

Industry Trends and Growth
The VR and AR markets are at a nascent stage of development and penetration, giving investors the opportunity to get in early on a high-growth potential sector. The overall market is expected to grow from $7.9 Billion in 2018 to
$44.7 Billion by 2024, a CAGR of 33.5%44. More than half of this growth is expected to come from hardware sales.

Large technology companies are making huge investments in the AR and VR space such as Facebook’s $2 Billion acquisition of VR headset maker Oculus. Others, like Sony and Samsung are dominating VR spend with Samsung’s ‘Gear’ leading the market for smartphone-based VR.

VR and AR are key themes within the fourth industrial revolution and are connected and supported by parallel developments in cloud computing and big data (data storage and access), future transportation (driver HUDs and mapping), robotics (remote surgery), cyber security and social media. As the cost of VR/AR devices continues to fall and as computer-generated imaging approaches the point of photo-realism, the industry is poised for significant growth.

HAN-GINS Tech Megatrend Equal Weight UCITS ETF

Identifying and investing in companies that are involved in the fourth industrial revolution can be an onerous and challenging research task for investors. That’s why HANetf created the HAN-GINS Tech Megatrend Equal Weight UCITS ETF (ITEK) - a UCITS compliant Exchange Traded Fund domiciled in Ireland which tracks the Solactive Innovative Technologies Index (Net Total Return).

ITEK seeks to provide exposure to a diverse basket of companies poised to benefit from the fourth industrial revolution. The index includes world-changing companies from developed and emerging markets whose products and services are driving innovation, transforming industries and changing lifestyles across the world in emerging industries including:

<table>
<thead>
<tr>
<th>Robotics</th>
<th>Future Cars</th>
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<tr>
<td>Genomics</td>
<td>Cloud Computing &amp; Big Data</td>
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<td>Blockchain</td>
<td>Social Media</td>
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<td>Cyber Security</td>
<td>Augmented &amp; Virtual Reality</td>
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</table>

Industry 4.0 is transforming our manufacturing world, providing consumers cheaper and greater choice whilst providing businesses with unrivalled insight into their manufacturing processes, machines they operate and services they provide. As throughout history, there are those that choose to adapt and embrace new technology and those that do not. Industry 4.0 will help those willing to embrace new technology to stay ahead of the curve while delivering a material difference in their bottom lines.

**High Growth Potential:** ITEK enables investors to access companies with high growth potential, operating at the leading edge of technological innovation that is affecting multiple sectors of the global economy

**Unconstrained Approach:** ITEK follows a transparent rules-based index that uses a systematic, modern industry classification system, providing exposure to emerging themes that traditional index-based products cannot

**Efficiency:** In a single trade, ITEK delivers access to over 80 companies with high exposure to the innovative technology theme

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44 https://www.marketsandmarkets.com/Market-Reports/reality-applications-market-d58.html
Global Exposure: ITEK is not limited to one region or country, capturing the full global innovation opportunity set.

Diversification: ITEK uses a double diversification approach to avoid concentration in mega-cap stocks. The portfolio aims to allocate equal weight to each innovative theme and then allocate equal weight constituents within that theme.

Key risks:

1. The value of equities and equity-related securities can be affected by daily stock and currency market movements.
2. Emerging & frontier markets are subject to greater market volatility than developed markets.
3. Investors’ capital is fully at risk and investors may not get back the amount originally invested.
4. Exchange rate fluctuations could have a negative or positive effect on returns.

Fund Details

The HAN-GINS Tech Megatrend Equal Weight UCITS ETF (ITEK) includes all the key Fourth Industrial Revolution themes and the leading corporations in this space. The ETF includes over 70 different holdings – covering seven underlying themes using an equal weighted structure. So each theme has equal exposure. Within each theme the underlying companies are also equally weighted.

The largest holdings below are all capped at 2% weighting. This ensure investors will have broad exposure to wide array of leading Cloud companies. It is a diverse group that cannot be accessed easily via traditional Tech indices. Using Solactive’s patented index methodology – a number of traditional and non-traditional IT players are included in the index – from Apple, Oracle, Intel and IBM; to Verizon, NVIDIA and General Electric. Global companies are also included, such as Chinese heavyweights – Baidu and Alibaba.

Please remember that the value of your investment may go down. When you trade ETFs, your capital is at risk.

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View our ITEK marketing content:

- ITEK Factsheet
About HANetf

HANetf is an independent ETF specialist working with third-party asset managers to bring differentiated, modern and innovative ETF exposures to European investors via unique white-label ETF/ETC platform.

Founded by two of Europe’s leading ETF entrepreneurs, Hector McNeil and Nik Bienkowski, HANetf provides a complete operational, regulatory, distribution and marketing solution for asset managers who want to successfully launch and manage UCITS ETFs.

HANetf’s full products list includes:

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<th>Name</th>
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<th>Borsa £</th>
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