

Indxx Disruptive Technologies Index



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## Introduction

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Technology has become an essential part of almost every kind of business. Companies worldwide rely on emerging technology to drive their innovation, strategy, and increase competitive advantage.

Disruptive technology is defined as a new technology that adds value and has the potential to change the way we live, work and do business. It not only redefines existing traditional business models and practices but also creates new markets and opportunities as well as the potential to improve existing products or services.

For example, the emergence of disruptive technologies such as **Robotics & Artificial Intelligence, Cloud Computing, 3D Printing, and Internet of Things** connectivity are helping contribute to the rise of what is called 'Industry 4.0' by some in that they allow businesses to digitally merge and transform the way they manufacture products and services.

In addition, companies can use **Data and Analytics** along with related tools like AI and machine learning to collect and organize data, reduce administrative tasks, and improve efficiency. The adoption of these innovative technologies is aiding various industries across sectors as diverse as healthcare, finance, heavy industries, and manufacturing.

**Mobile Payments** and **FinTech** eliminate the need for users to carry cash or credit cards and help them transfer funds in a secure manner and have the ability to completely transform the world financial system with technologies like blockchain. And as many consumers experience on a near daily basis, **Cybersecurity** is increasingly become a key concern as the world becomes more and more dependent on technology. And disruption is not limited just to the external world and cyberspace but is also evident in **Healthcare Innovation** and the way we humans receive our medical care.

All of the aforementioned disruptive technologies need electricity to operate, and in that area **Clean Energy and Smart Grid** are playing a key role in disrupting and transforming the way the world generates and distributes power.

*The Indxx Disruptive Technologies Index ("The Index") is based around companies that enter traditional markets with new digital forms of production and distribution, are likely to disrupt an existing market and value network, displace established market leading firms, products and alliances and increasingly gain market share.*

The expected growth of disruptive technologies in the next few years is best understood by a few data points:

- The worldwide market for 3D printing products and services is anticipated to exceed \$40 billion by 2024.<sup>1</sup>
- Wind and solar energy are expected to increase dramatically, generating 50% of the world's electricity by 2050.<sup>2</sup>
- Public cloud spending is forecasted to grow from \$229 billion in 2019 to reach nearly \$500 billion in 2023, a five-year compound annual growth rate (CAGR) of 22.3 percent.<sup>3</sup>
- The cybersecurity market is expected to grow from \$152.71 billion in 2018 to \$248.26 billion by 2023, a CAGR of 10.2%.<sup>4</sup>
- The global market for data analytics will see a CAGR of 30.08% from 2017-2023, growing to \$77.64 billion.<sup>5</sup>
- The global FinTech market is expected to grow to \$124.3 billion by the end of 2025, a CAGR of 23.84%.<sup>6</sup>
- The global digital health market, valued at \$122.66 billion in 2017, is expected to generate revenue of \$423.11 billion by the end of 2024, a CAGR of 19.35%.<sup>7</sup>
- The Internet of Things market, including hardware, software, systems integration, and data and telecom services, is expected to grow to \$520 billion by 2021 – more than double the \$235 billion spent in 2017.<sup>8</sup>
- The global digital payments market was valued at \$3,417 billion in 2018, and is expected to reach \$7,640 billion by 2024, recording a CAGR of 13.7% from 2019-2024.<sup>9</sup>
- The global robotics market is expected to exceed \$77 billion by 2022, from \$32 billion in 2017.<sup>10</sup>

## 1. 3D Printing

### 1.1 Introduction to 3D Printing

Significant advances in “additive manufacturing technology,” commonly known as 3D printing, over the past decade have transformed the ways in which products are designed, developed, manufactured, and distributed. 3D printing is a process for making a physical object from a three-dimensional digital model, typically by laying down many successive thin layers of a material. 3D printing covers a basket of processes and technologies that provide products in different materials and the capability to produce different parts. 3D printing’s ability and advantages over traditional manufacturing open up many disruptive opportunities as diverse as product design, development, customization services, and the restructuring of supply chains for higher efficiency.

- Global spending on 3D printing (including hardware, materials, software, and services) is expected to grow to \$23.0 billion in 2022, with a five-year CAGR of 18.4%.<sup>11</sup>
- Similar estimates indicate that revenue for the 3D printing industry is forecasted to climb to \$23.9 billion in 2022, and \$35.6 billion in 2024.<sup>12</sup>

3D printing adds value at the industrial, personal/consumer and local levels, and creates a host of benefits which the traditional method of manufacturing lacks. The shift of production and distribution based on demand, on site, and customized production models could reduce the imbalance between export and import countries. Additional benefits include:

- Customization of products according to individual needs and requirements.
- Reducing the time and labor cost of the product development process.
- Emerging as an energy efficient tool by making use of standard materials in exact amounts, with little waste.
- Reduced complexity in the production of materials.

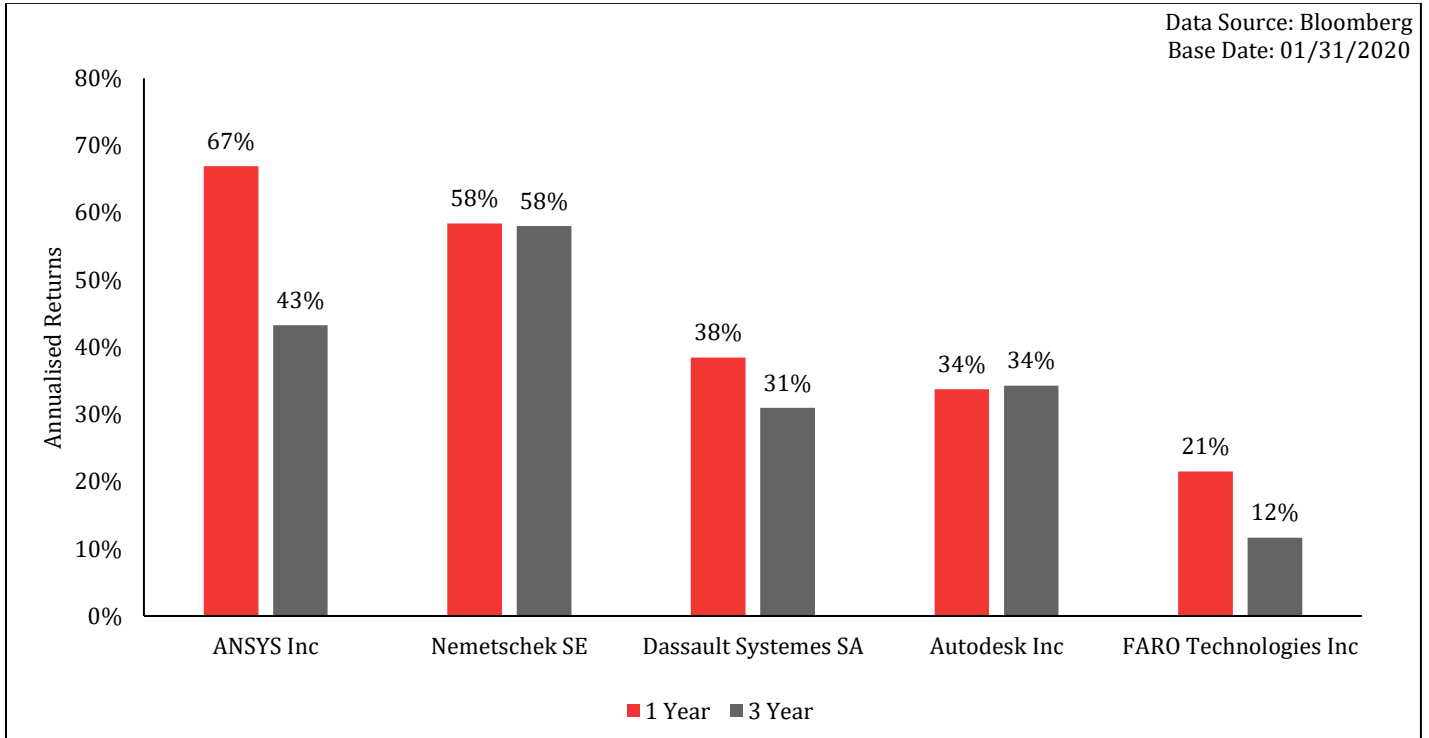
### 1.2 3D Printing Innovations Included in The Index:

Innovations in 3D Printing	Description	Examples of Listed Companies
<b>3D Printing Hardware</b>	Companies that develop, manufacture materials associated with 3D Printing or equipment related to 3D printing.	Proto Labs, Inc.
<b>CAD and 3D Printing Software</b>	Companies that provide applications and software-based solutions for 3D printing apart from dealing with CAD applications. They should not be dealing in any hardware-based manufacturing.	Dassault Systèmes SA Autodesk, Inc. ANSYS, Inc. Nemetschek SE
<b>3D Printing Materials and Centers</b>	Companies that are involved in materials associated with 3D printing exclusively and associated with centers, but should not be associated with any software-based solutions.	3D Systems Corp. Stratasys Ltd.
<b>3D Scanning and Measurements</b>	Companies that are involved in developing scanners and measurement devices that are related to 3D printing.	FARO Technologies, Inc.

### 1.3 3D Printing Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>Proto Labs, Inc</b>	Makes use of digital manufacturing and is the world's fastest manufacturing source for rapid prototypes and on demand production parts. The company launched its industrial-grade 3D printing services in 2014, and since then has become a leader in assisting developers, designers and engineers in moving from prototyping to low-volume production.
2.	<b>PTC, Inc</b>	Makes products using personalized 3D product design and development solutions. The creation, analysis and sharing product designs downstream is done by using 2D CAD, 3D CAD, parametric and direct modelling capabilities.
3.	<b>Nemetschek SE</b>	Develops software solutions that enable a sustainable and efficient process for complex construction and infrastructure projects.
4.	<b>FARO Technologies, Inc.</b>	The world's most trusted source for 3D measurement, imaging and realization technology. The company develops and manufactures leading edge solutions that enable high-precision 3D capture, measurement and analysis across a variety of industries including manufacturing, construction, engineering and public safety.
5.	<b>ANSYS, Inc</b>	Focused on engineering simulation and is one of the global leaders in this sector. It develops, markets and supports engineering simulation software used to predict how product designs will behave in real-world environments.
6.	<b>Dassault Systèmes SA</b>	Develops and markets PLM software and services that support industrial processes by providing a 3D vision of the entire lifecycle of products from inception to maintenance.
7.	<b>Renishaw Plc</b>	World leader in the field of metal additive manufacturing (3D printing) with machines that produce parts from metal powder.
8.	<b>Autodesk, Inc</b>	A leader in 3D design, engineering and entertainment software. The flagship product of is AutoCAD. AutoCAD is primarily used by architects, engineers, and structural designers to design, draft, and model buildings and other structures.
9.	<b>3D Systems Corp</b>	Creates products concept models, functional prototypes, master patterns for tooling, as well as production parts for direct digital manufacturing. It provides 3D products and services, including 3D printers, print materials, parts services and digital design tools.
10.	<b>Stratasys Ltd</b>	Has been in the 3D printing business since 1988, and operates primarily in the healthcare, aerospace, automotive and education markets. The company holds over 600 granted or pending additive manufacturing patents globally.

1.4 Top 5 3D Printing Companies in The Index based on highest Trailing 12 Month Returns



## 2. Clean Energy and Smart Grid

### 2.1 Introduction to Clean Energy and Smart Grid

Most of the electricity generated from power stations uses fossil fuels. The burning of fossil fuels releases toxic gases into the environment. Clean energy is the use of renewable energy sources such as wind, rain, sunlight, geothermal heat and others to produce power with little or no pollution and global warming emissions. These energy sources are often regenerative and do not produce harmful gases. Smart grid enables the integration of renewable energy sources and provides a more efficient, sustainable and secure way of energy transmission. It uses digital technology in an electrical network that allows for two-way communication between the utility and its customers. Clean energy and smart grid represent an unprecedented opportunity to move the energy industry into a new era of reliability, availability, and efficiency.

With the increase in world's environmental pollution problems and energy shortages, the shift to clean energy and smart grid has become inevitable. Government policies and mandates for sustainable energy are also driving the growth of this market.

- By 2040, zero-emission energy sources will make up 60% of installed generation, with wind and solar accounting for 64% of the 8.6TW capacity increase over the next 25 years.<sup>13</sup>
- The smart grid market size is expected to grow from \$23.8 billion in 2018 to \$61.3 billion by 2023, a CAGR of 20.9%.<sup>14</sup>

The growth in the world's population coupled with rapid urbanization and increased electrification of end uses such as transportation, large appliances, and others have resulted in a substantial increase in energy demand. The burning of fossil fuels to generate energy has damaging effects on the environment. According to the World Health Organization (WHO), air pollution is the world's largest environmental risk. Thus, the need for a more efficient and feasible alternative option arises. Besides meeting the increasing demand for energy, clean energy and smart grid also ensure the reduction in greenhouse emissions and contribute in improving the quality of air.

### 2.2 Clean Energy and Smart Grid Innovations Included in The Index:

Innovations in Clean Energy and Smart Grid	Description	Examples of Listed Companies
<b>Clean Energy Producers</b>	These companies produce carbon free energy such as solar, wind, hydro, and geothermal energy.	China Longyuan Power Group Corp.
<b>Clean Energy Equipment Providers</b>	These companies manufacture clean energy equipment like wind turbines, solar panels components, etc.	First Solar Inc.
<b>Electric Infrastructure and Grid Related Devices</b>	These companies are providers of electric grid, electric meters and devices, networks and other grid related activities.	ABB Ltd.

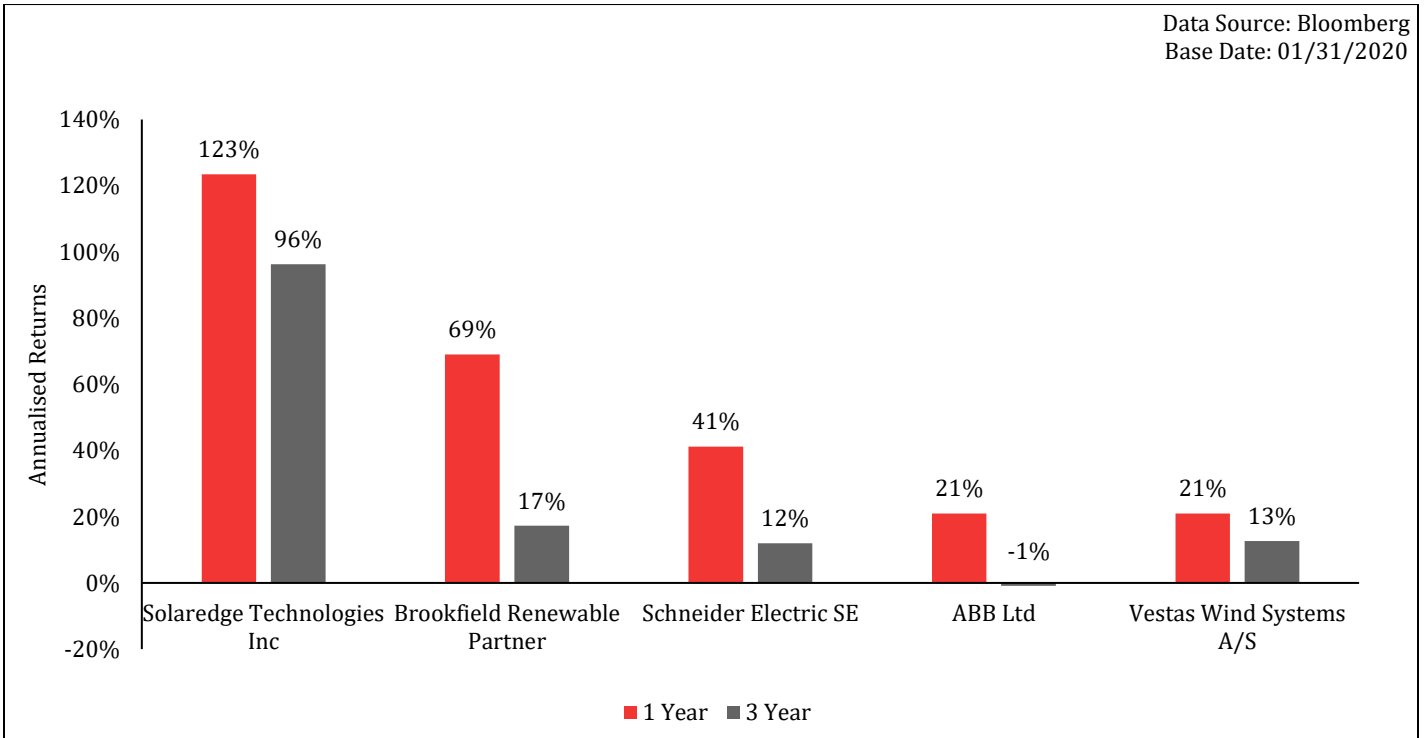


### 2.3 Clean Energy and Smart Grid Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>Solaredge Technologies Inc</b>	Provides innovative solar power harvesting and monitoring solutions for residential, commercial, and utility-scale solar PV. The Zacks consensus estimate for SolarEdge Technologies' 2020 earnings is pegged at \$5.10 per share on revenues of \$1.65 billion. The bottom-line estimate suggests a 26% year-over-year increase.
2.	<b>China Longyuan Power Group Corp. Ltd.</b>	A pioneer of new energy industry in China. Since 2005, its wind power installed capacity has realized a growth of nearly 100% year on the year. It recently gained approval for and launched 14 technical projects, of which 7 projects including the "Research and Application of Key Technology for Intelligent Offshore Wind Farm" were approved by CHN Energy.
3.	<b>First Solar, Inc.</b>	Uses a proprietary thin film semiconductor technology for designing and manufacturing photovoltaic modules that is one of the lowest cost in the world. First Solar is one of only five modules in the world to pass Atlas 25+, the Thresher and TUV Long-Term Sequential Tests.
4.	<b>Siemens Gamesa Renewable Energy SA</b>	A key player and innovative pioneer in the renewable energy sector, with installed products and technology in more than 90 countries, with a total capacity base of over 99 GW. Its competitive advantage lies in the fact that it is actively engaged in all three areas of wind power business: onshore, offshore and service.
5.	<b>ABB Ltd.</b>	Is a pioneering technology leader in electrification products, power grids, industrial automation and robotics. ABB operates in more than 100 countries serving customers in the utilities, transport, and infrastructure globally. ABB's world-first 420 kilovolt single-phase transformers offer an environmentally friendly, energy-efficient and reliable high-voltage alternative for a sustainable future.
6.	<b>Schneider Electric SE</b>	A global specialist in energy management and automation. By 2025, Schneider Electric has committed to facilitate access to lighting and communication to 50 million people with low-carbon solutions and to train 1 million underprivileged people in energy skills.
7.	<b>Brookfield Renewable Partners LP</b>	A globally diversified owner and operator of renewable power assets. It is amongst the largest pure play renewable business globally with over 19,000 megawatts largely spread across five complementary technologies: hydro, wind, solar, distributed generation and storage. The company is a global leader in hydroelectric power, which comprises approximately 74% of its portfolio.
8.	<b>Xinjiang Goldwind Science &amp; Technology Co., Ltd.</b>	Has been hailed as one of China's most innovative companies. It is engaged in the research and development, manufacture and design of wind turbines, wind turbine components, wind power generation sets, and other equipment. The company now operates in 6 continents and has more than 44GW of installed wind capacity.
9.	<b>Vestas Wind Systems A/S</b>	Core business is to develop, manufacture and maintain wind energy solutions. Vestas has more than 113 GW of wind turbines in 81 countries. Wind energy manifested its position as a leading global energy source in 2019, driving Vestas' order intake to a record 17.9 GW, and a 20% growth in revenue.

10.	<b>Prysmian SpA</b>	Develops energy and telecom cable systems with lower environmental impact and high value for its customers. In 2019, Prysmian continued, for the fourth consecutive year, to be included in the prestigious Carbon Clean 200 report. The Clean 200 are the largest 200 public companies ranked by green energy revenues.
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### 2.4 Top 5 Clean Energy and Smart Grid Companies in The Index based on highest Trailing 12 Month Returns



## 3. Cloud Computing

### 3.1 Introduction to Cloud Computing

Cloud computing, often referred to as simply “The Cloud,” is the delivery of on-demand computing resources — everything from applications to data centers — over the Internet on a pay-for-use basis. It offers online data storage, infrastructure and application. It also provides a simple way to access servers, storage, databases and a broad set of application services over the Internet.

Cloud computing platforms and applications are proliferating across enterprises today, serving as the IT infrastructure driving new digital businesses.

- By 2025, 75% of enterprise-generated data will be created and stored at the edge.<sup>15</sup>
- Cloud data centers will process 94% of workloads in 2021.<sup>16</sup>

Cloud computing comes with a bouquet of benefits and as a result many corporations, government agencies and other organizations are beginning to adopt the use of this technology:

- Eliminates the capital expenses of buying hardware and software to run data centers.
- Provides the ability to scale globally, meaning that companies can get the right amount of resources in virtually any geographic location.
- Makes data backup, disaster recovery, and business continuity easier and less expensive, since data can be mirrored at multiple sites on the cloud computing provider’s network.

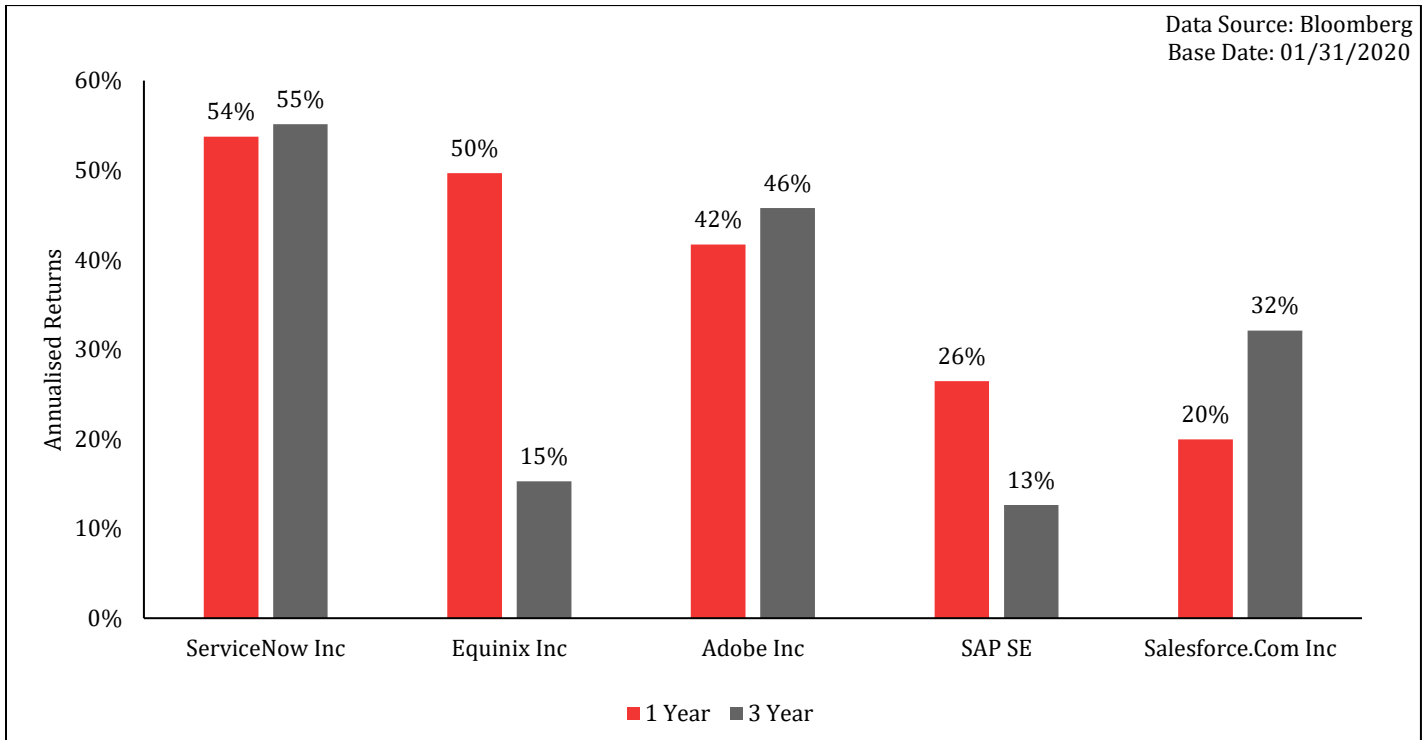
### 3.2 Cloud Computing Innovations Included in The Index:

Innovations in Cloud Computing	Description	Examples of Listed Companies
<b>Infrastructure as a Service</b>	With IaaS, companies provide virtualized computing resources over the Internet & the companies that host the infrastructure components.	VMware, Inc.
<b>Platform as a Service</b>	Platform as a service refers to cloud computing services that supply an on-demand environment for developing, testing, delivering and managing software applications. PaaS is designed to make it easier for developers to quickly create web or mobile apps, without worrying about setting up or managing the underlying infrastructure of servers, storage, network and databases needed for development.	Salesforce.com Inc.
<b>Software as a Service</b>	Software as a service is a method for delivering software applications over the Internet, on demand and typically on a subscription basis. With SaaS, cloud providers host and manage the software application and underlying infrastructure and handle any maintenance, like software upgrades and security patching.	Netflix, Inc. SAP SE, ServiceNow, Inc.

### 3.3 Cloud Computing Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>Netflix, Inc.</b>	After officially using Amazon's services, Netflix started to become a software technology pioneer for cloud computing, doing things that no one had done before. It can support seamless global service by using Amazon Web Services (AWS). AWS enables Netflix to quickly deploy thousands of servers and terabytes of storage within minutes.
2.	<b>Adobe, Inc.</b>	Offers many of its products via a Software-as-a-Service ("SaaS") model or a managed services model (both of which are referred to as hosted or cloud-based) as well as through term subscription and pay-per-use models.
3.	<b>ServiceNow, Inc.</b>	ServiceNow Cloud Management optimizes cloud operations. Its software can automate routine business tasks and help employees work more efficiently, keeping them from falling behind in a digital world.
4.	<b>Salesforce.com, Inc.</b>	Widely regarded as one of leaders in cloud computing and software-as-a-service (SaaS), Salesforce.com has seen high revenue growth for the past few years. Revenue has increased from \$8.4 billion in FY 2017 to \$13.3 billion in FY 2019.
5.	<b>VMware, Inc.</b>	Building on its technological expertise, market presence and business knowledge to emerge as a strong partner for organizations adopting public and hybrid cloud solutions. In February, 2020 it was positioned as a leader in the IDC MarketScape 'Worldwide Virtual Client Computing 2019-2020 Vendor Assessment.'
6.	<b>SAP SE</b>	The fastest growing cloud company at scale in the enterprise software applications industry. Its cloud revenue grew 39% year over year in 2019. SAP's rapidly expanding cloud business together with solid growth in support revenue continued to drive the share of more predictable revenue.
7.	<b>Workday, Inc.</b>	Leading provider of enterprise cloud applications for finance and human resources and delivers financial management, human capital management, planning, and analytics applications designed for the world's largest companies. As per Bloomberg, it saw a Year-on- Year revenue growth (based on January 31, 2020) of 28.5%.
8.	<b>Digital Realty Trust, Inc.</b>	A leading global provider of data center, colocation and interconnection solutions.
9.	<b>Equinix, Inc.</b>	Offers data center industry's broadest choice in cloud service providers, with many of them offering direct connections to their cloud infrastructure via Equinix Cloud Exchange. Equinix is the only data center provider offering direct connection to AWS, Microsoft Azure and Oracle Cloud.
10.	<b>Spotify Technology SA</b>	Is moving its infrastructure completely to the Google Cloud Platform in an all-in bet that mirrors the Amazon Web Services-Netflix relationship.

3.4 Top 5 Cloud Computing Companies in The Index based on highest Trailing 12 Month Returns



## 4. Cybersecurity

### 4.1 Introduction to Cybersecurity

Cybersecurity encompasses technologies that are used to protect highly sensitive information from being stolen, compromised or attacked. These solutions enable both enterprises and individuals to protect their software and hardware from unauthorized access. With the rise in cyberterrorism and stricter data protection directives, the cybersecurity market is growing rapidly.

Cybersecurity solutions consist of technologies that are designed to protect systems, networks and data from cyber-attacks.

- The global cyber security market is projected to register a CAGR of 4.51%, growing from \$11.9 billion in 2016 to \$18.5 billion by 2026.<sup>17</sup>
- Smart companies are spending billions to upgrade their digital defenses. In 2019, worldwide spending on information security products and services was forecast to have grown 8.7% to \$124 billion.<sup>18</sup>
- The World Economic Forum Global Risks Report 2019 rates a large-scale breach of cybersecurity as one of the five most serious risks facing the world.<sup>19</sup>

In an increasingly connected world, organizations need to be in a position to manage their risks. The proliferation of cyber-attacks has a damaging effect on organizations, governments and individuals. With sensitive data residing everywhere, the need for advanced security solutions has become even more critical. Cybersecurity solutions and services provide a lot of advantages:

- Protects the data and information of a company.
- Provides privacy to its users.
- Increases productivity

### 4.2 Cybersecurity Innovations Included in The Index:

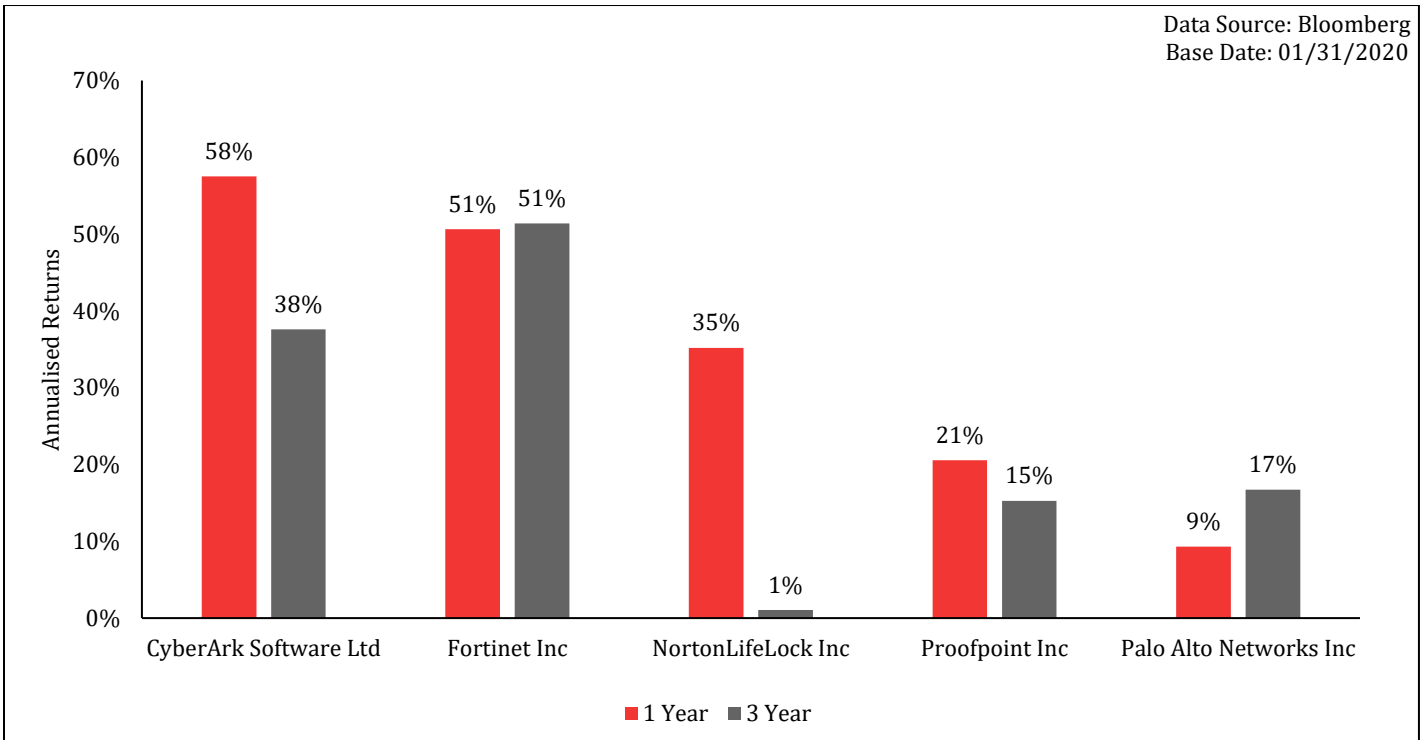
Innovations in Cybersecurity	Description	Examples of Listed Companies
<b>Network Security Software or Hardware Providers</b>	These companies provide either software, hardware or module to make network/computer systems more secure.	Fortinet Inc. Zscaler Inc. Okta Inc.
<b>Data Storage Infrastructure Providers</b>	These companies work in providing secure data storage infrastructure like data centers.	
<b>Communication security software or hardware providers</b>	These companies provide secured communication devices and software for defense or enterprise purposes.	

### 4.3 Cybersecurity Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>CyberArk Software Ltd</b>	Operates in a rapidly evolving industry focused on securing organizations' IT systems and sensitive data. The company is an undisputed leader in the Privileged Access Management market and is serving more than 50% of the Fortune 500 companies. It is the only publicly traded company 100% focused on privileged access management.
2.	<b>Fortinet, Inc.</b>	A provider of network and content security. Gartner has recognized Fortinet as a Leader in the 2019 Magic Quadrant for Network Firewalls. It ranks number one in the most security appliances shipped worldwide and more than 450,000 customers trust Fortinet to protect their businesses.
3.	<b>Proofpoint, Inc.</b>	A next generation cybersecurity company that designs an integrated suite of threat, information, and brand protection solutions for various channels including the web, the cloud, email and social media. More than half of the Fortune 1000, rely on Proofpoint's people-centric security and compliance solutions to mitigate their most critical risks across email, the cloud, social media, and the web.
4.	<b>Trend Micro, Inc.</b>	For the past 30 years, Trend Micro has been making the exchange of digital information safe. It is a leader in Gartner Magic Quadrant for Endpoint Protection Platforms and the Forrester Wave for Endpoint Security Suites. Its products provide a connected threat defense with centralized visibility and faster protection.
5.	<b>Palo Alto Networks, Inc.</b>	A global cybersecurity leader. Over 85 of the Fortune 100 and more than 63% of the Global 2000 rely on Palo Alto Networks to improve their cybersecurity posture. Fiscal year 2019 revenue was \$2.9 billion, a 28% increase.
6.	<b>Zscaler, Inc.</b>	A provider of cloud-based security platform, it delivers the entire gateway security stack as a service. A global, internet security platform used by more than 5,000 enterprises, governments and military organizations worldwide.
7.	<b>NortonLifeLock, Inc.</b>	A global leader in consumer Cyber Safety, it helps secure the devices, identities, online privacy, and home and family needs of nearly 50 million consumers, providing them with a trusted ally in a complex digital world.
8.	<b>Okta, Inc.</b>	Provides enterprise identity management solutions. Its customers can easily and securely adopt the technologies they need to fulfill their missions. Over 5,150 organizations, including 20th Century Fox, JetBlue, Nordstrom, Slack, Teach for America and Twilio trust Okta to securely connect their people and technology.
9.	<b>Check Point Software Technologies Ltd.</b>	Offers multilevel security architecture that protects all networks, cloud and mobile operations of a business. Check Point protects over 100,000 organizations of all sizes. Its products contain the world's most advanced security technology. The company currently holds 73 U.S. patents, more than 30 U.S. patents pending, and additional patents issued and patent applications pending worldwide.

10.	<b>Avast Plc</b>	Offers consumer personal computer antivirus security software under the Avast and AVG brands. It has a massive global user footprint with over 435 million users.
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#### 4.4 Top 5 Cybersecurity Companies in The Index based on highest Trailing 12 Month Returns





## 5. Data and Analytics

### 5.1 Introduction to Data and Analytics

Every day, the world creates vast quantities of data. By analyzing, combining and processing this data, people and organizations can derive meaningful insights. Data and analytics have altered the dynamics in many industries, and change will only accelerate as machine learning and deep learning develop capabilities to think, problem-solve, and understand language.

Data Analytics refers to the process of examining data sets to derive conclusions about the data, with the aid of specialized systems and software. The resulting insights can be used to personalize products and services on a wide scale.

Data analytics technologies and techniques enable organizations to make more-informed business decisions. All leading firms today have a remarkable depth of analytical talent that creates scientific models, theories and hypotheses that help them improve their businesses.

- The Data Analytics Market is expected to grow at a CAGR of 30.08% from 2020 to 2023, which would equate to \$77.6 billion.<sup>20</sup>
- Big Data Analytics (BDA) revenues will maintain this pace of growth throughout the 2018-2022 forecast with a five-year CAGR of 13.2%. By 2022, IDC expects worldwide BDA revenue will be \$274.3 billion.<sup>21</sup>

The volume of data continues to double every three years as information pours in from digital platforms, wireless sensors, and billions of mobile phones. The analysis of this data meets the needs of diverse sectors including financial services, IT, education, medicine, travel and leisure, media, retail, and advertising in many ways such as:

- Data and analytics helps organizations determine how to structure teams, resources, and workflows.
- In product innovation, data and analytics can transform research and development. Leading pharmaceutical companies are using data and analytics to aid with drug discovery.
- In personal transportation, ride-sharing services use geospatial mapping technology to collect crucial data about the precise location of passengers and available drivers in real time. The introduction of this new type of data enables efficient and instant matching, a crucial innovation in this market.

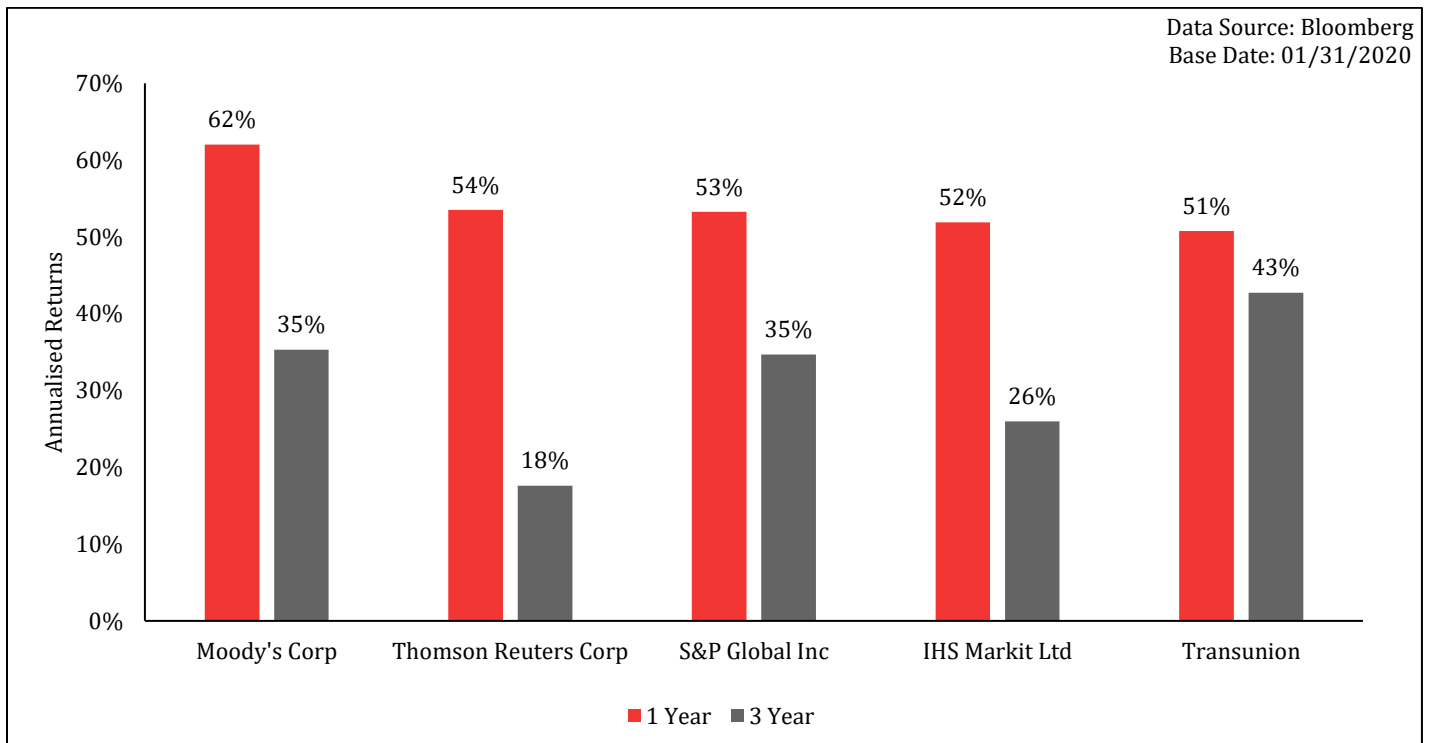
### 5.2 Data and Analytics Innovations Included in The Index:

Innovations in Data and Analytics	Description	Examples of Listed Companies
<b>Data Analytics Tools and Services</b>	These companies empower users to explore, and visualize data from multiple sources, thus providing them with greater insight into their business processes. These provide various functions such as predictive analytics, text and sentiment analytics, location analytics, etc.	IHS Markit Ltd.
<b>Decision Making Software</b>	Allows users to focus on the fundamental value judgement without focusing on the technical implementation details.	Wolters Kluwer NV
<b>Market Intelligence Services</b>	These companies provide advanced market research and analysis techniques that reliable and competitive market intelligence to global organizations.	S&P Global, Inc. Thomson Reuters Corp.

### 5.3 Data and Analytics Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>S&amp;P Global, Inc.</b>	A leading provider of credit ratings, benchmarks, analytics and data to capital and commodity markets. The company's divisions include S&P Global Ratings, S&P Global Market Intelligence, S&P Dow Jones Indices and S&P Global Platts. 70% of its revenue is tied to subscription-based business and asset-linked fees that are ongoing in nature.
2.	<b>Splunk Inc.</b>	Helps organizations drive operational performance and business results by gaining visibility into business processes. Offers Splunk Enterprise, a machine data platform. It has over 15,000 customers in 110 countries including 90 of the Fortune 100 companies.
3.	<b>Wolters Kluwer NV</b>	Enables tax, finance, healthcare and regulatory professionals be more effective and efficient with its intelligent tools. In 2019, it saw double-digit growth (11%) in diluted adjusted EPS.
4.	<b>Transunion</b>	Provides solutions that help create economic opportunity and personal empowerment for hundreds of millions of people in more than 30 countries. Its technology and analytics platform expansion enables rapid and effective transfer of most advanced global solutions (CreditVision®, IDVisionSM, DecisionEdge® and PramaSM suite)
5.	<b>IHS Markit Ltd.</b>	An information powerhouse and a global leader in critical information, analytics and solutions. In the first quarter of 2020, it reported revenue of \$1.08 billion, including total organic revenue growth of 6%.
6.	<b>Moody's Corp.</b>	Owns Moody's Investor Services, which rates fixed income debt securities and Moody's Analytics, which provides software and research for economic analysis and risk management. Over 11,000 employees in more than 40 countries, combines international presence with local expertise and over a century of experience in financial markets.
7.	<b>Verisk Analytics, Inc.</b>	A member of S&P 500 Index and part of the Nasdaq 100 Index, Verisk offers predictive analytics and decision support solutions to customers in insurance, energy and specialized markets, and financial services.
8.	<b>Experian Plc</b>	Operates at the heart of the data and analytics revolution with expertise in providing credit information. In 2019, it reported revenue of \$4,861 million.
9.	<b>RELX Plc</b>	Engages in the provision of information and analytics for professional and business customers across multiple industries. Focuses on acquisitions of select, targeted datasets and analytics, and assets in high growth markets that support organic growth strategies. Recently entered into an agreement to acquire ThreatMetrix, a leader in the global risk-based authentication sector.
10.	<b>Thomson Reuters Corp.</b>	Derives majority of its revenue through subscription-based services and addresses the need of the global marketplace through its software, proprietary databases and workflow tools. Provides business, financial, national and international news to professionals through Thomson Reuters desktops. On August 1, 2019, Thomson Reuters and private equity funds affiliated with Blackstone agreed to sell Refinitiv to London Stock Exchange Group plc for a total enterprise value of approximately \$27 billion (at the time of announcement). <sup>22</sup>

### 5.4 Top 5 Data and Analytics Companies in The Index based on highest Trailing 12 Month Returns



## 6. FinTech

### 6.1 Introduction to FinTech

Broadly, the term “Financial Technology”, describes the digital and online technologies that are targeted at improving and automating the banking and financial services industry. The wider objective of the FinTech industry is to innovate the way people transact their personal and commercial finance. FinTech firms have taken advantage of the increasing ubiquity of internet access and smartphones to launch digital versions of existing financial products.

FinTech is an intersection of technology and financial services which has disrupted the way financial institutions and banks function today. The subsegment focus areas of FinTech include:

- Digital payments (PayTech)
- Fully digital insurance (InsurTech)
- Banking (BankTech)
- Wealth management services (WealthTech)
- Creation of marketplaces for selling financial products.

FinTech is emerging as a powerful theme, driven by the rapid adoption of cutting-edge technologies across the financial services industry.

- AI interfaces and chatbots have redefined customer services, and its growing popularity will enable the AI-oriented fintech market to expand at a CAGR of 21.72% during the 2018-2023 period.<sup>23</sup>
- Worldwide spending on IT by financial services firms will be nearly \$500 billion in 2021, from \$440 billion in 2018.<sup>24</sup>

With the delivery of products and services that are actively disrupting and innovating the global economy, the FinTech market has continued to broaden and diversify globally. A mix of FinTech sectors are drawing increasing interest, including data analytics and artificial intelligence. Technology has revolutionized the financial services and banking industry. With the use of websites and mobile applications, users can now manage their wealth and assets with one click.

After the financial crisis, banks were reticent to lend, shutting a lot of consumers out of the lending market. Peer to peer lending platforms, armed with a different way of assessing risk, reshaped the loan industry. FinTechs have also enabled individuals to borrow money from multiple people via crowdfunding platforms. Innovations in the payment ecosystem allows individuals and businesses to transfer money and process payments more quickly and securely.

### 6.2 FinTech Innovations Included in The Index:

Innovations in FinTech	Description	Examples of Listed Companies
<b>P2P and Marketplace Lending</b>	Companies that provide online platforms for peer-to-peer and marketplace lending that is disrupting the traditional lending sector.	LendingTree, Inc.
<b>Crowd-Funding</b>	Companies that provide online platforms for sourcing funds from individual members.	
<b>Blockchain and Alternative Currencies</b>	Companies that are involved in the development of blockchain technology, or that utilize blockchain technology to provide financial services. Companies that are involved in the development of other alternative currencies are also eligible for inclusion.	

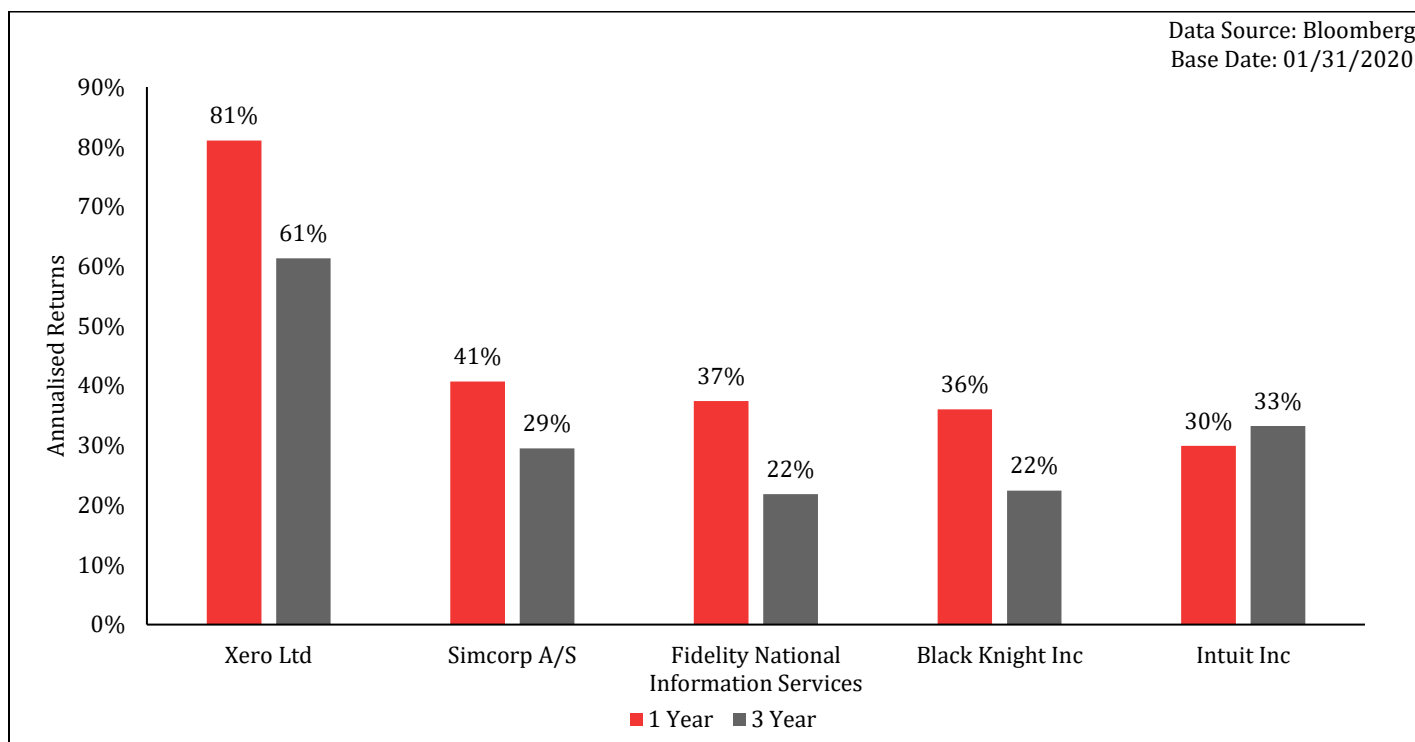
<b>Personal Finance Software, Automated Wealth Management and Trading</b>	Companies that are involved in developing personal finance software, robo-advisor solutions that leverage automation/algorithms, and/or are technology-enabled investment solution providers. This does not include traditional fund administrators that provide technology services.	Xero, Ltd.,
<b>Enterprise Solutions</b>	Companies that provide scalable technology solutions focused on disrupting traditional areas of financial services such as lending, credit scoring and banking.	StoneCoLtd. SimCorp A/S Intuit, Inc.

### 6.3 FinTech Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>Intuit, Inc.</b>	Engages in the provision of business and financial management solutions. It develops and sells financial, accounting, and tax preparation software and related services for small businesses, accountants, and individuals.
2.	<b>Temenos AG</b>	Together with its subsidiaries, develops, markets, and sells integrated banking software systems primarily to banking and other financial services institutions worldwide. Temenos software is proven to enable its top-performing clients to achieve industry-leading cost-income ratios of 26.8% and returns on equity of 29.0%, 3X better than the industry average.
3.	<b>Xero Ltd.</b>	A cloud-based accounting software for small businesses and advisors. Founded in 2006 in New Zealand, Xero is one of the fastest growing software as a service companies globally. It currently has more than 2 million subscribers globally.
4.	<b>SimCorp A/S</b>	A leading provider of investment management solutions and services, invests more than 20% of its revenue into R&D, ensuring that its solution is capable of supporting the customer's key requirements. It has more than 16,000 active daily users and over \$19 trillion managed on its solution by clients. Almost half of the world's Top 100 investment managers have chosen SimCorp as their partner.
5.	<b>SS&amp;C Technologies Holdings, Inc.</b>	Develops cloud based financial services technology solutions. Ranked number 10 on Fortune's 2019 100 Fastest-Growing Companies list and also featured in Fortune's biggest revenue section.
6.	<b>Guidewire Software, Inc.</b>	Delivers the industry platform that Property and Casualty (P&C) insurers rely upon to adapt and succeed in a time of accelerating change. Has been recognized by Gartner in its 2019 Gartner Magic Quadrant for Non-Life Insurance Platforms.
7.	<b>Black Knight, Inc.</b>	A trusted, long-standing business partner to many of the nation's leading lenders and servicers. The Data & Analytics division of Black Knight manages the nation's leading repository of loan-level residential mortgage data and performance information on the

		majority of the overall market, including tens of millions of loans across the spectrum of credit products and more than 160 million historical records.
8.	<b>StoneCo. Ltd.</b>	A leading provider of financial technology solutions that empower merchants and integrated partners to conduct electronic commerce seamlessly across in-store, online, and mobile channels. In Q4 2019, the company saw a 47.9% year-over-year growth in total revenue and income grew and had an adjusted net margin of 35.1%, the highest margin achieved by it ever.
9.	<b>LendingTree, Inc.</b>	Empowers its customers to simplify financial decisions. Provides consumers with free credit scores, credit monitoring and recommendations to improve their credit health. Has been working to diversify its business through disciplined M&A, and recently bought Student Loan Hero, a personal finance website that helps borrowers manage their student debt, and Ovation Credit Services, a provider of credit services.
10.	<b>Fidelity National Information Services</b>	A payment services provider. The company provides credit and debit card processing, electronic banking services, check risk management, check cashing, and merchant card processing services to financial institutions and merchants.

#### 6.4 Top 5 FinTech Companies in The Index based on highest Trailing 12 Month Returns



## 7. Healthcare Innovation

### 7.1 Introduction to Healthcare Innovation

Healthcare innovations are centered on the development of new procedures, medical devices, drugs, and also include the development of new diagnostic procedures and therapies. These advancements range from new pharmaceutical agents and procedures to more precise diagnostic scanners and surgical robots. Innovation in healthcare is becoming a key trend in many emerging market countries as well as developed markets. Disruption and innovation in healthcare enables patients and hospitals to have a modern infrastructure that enables technological innovations like connected medical devices via IoT and enhanced functional delivery of care, while digital clinical workspaces are transforming the practical delivery of care.

Recently, healthcare has experienced an explosion of innovation designed to improve life expectancy and quality of life. The healthcare industry is experiencing its most rapid pace of innovation ever, and this shift has been driven in part by technology, with new innovations increasing the value for health care. Some data points from Deloitte Global Healthcare Outlook 2018 are:

- Spending on the global geriatric care market (home health, remote patient monitoring, etc.) will likely exceed US\$1.4 trillion by 2023.<sup>25</sup>
- Worldwide pharmaceutical and biotech R&D is forecast to grow 2.4% annually to 2022. Total R&D spend is expected to reach \$181 billion in 2022, compared to \$156.7 billion in 2016.<sup>26</sup>

Globally, healthcare is an industry in need of innovation. Technologies such as cloud computing and blockchain are growing in use and also benefitting the healthcare industry by delivering critical patient information securely. Health care organizations are also exploring augmented reality for the delivery of services such surgeries and recovery, and artificial intelligence for IT administration but also diagnosis of diseases and increased efficiency.

The World Health Organization estimates that there is a shortage of over 5 million doctors globally, leaving more than half the world's population without access to even the most basic healthcare services. The latest artificial intelligence capabilities are making it increasingly possible for anyone, irrespective of their geography, wealth or circumstances, to have free access to health advice and other advantages such as:

- Appropriate treatments are delivered at the appropriate time, in the appropriate place, for the appropriate patient.
- Clinicians use technology to more accurately diagnose and treat illness and deliver care.
- Patient data is in one, easily accessible place
- Patients are informed and actively involved in their treatment plan.
- New, cost-effective delivery models bring health care to places and people that don't have it.

### 7.2 Healthcare Innovations Included in The Index:

Innovations in Healthcare	Description	Examples of Listed Companies
<b>Robotic Assistance</b>	Companies that develop, manufacture, sell or make use of robots to assist in surgery, rehabilitation and treatment solutions that set the standard of care with the aim of helping patients live longer, better lives.	Intuitive Surgical, Inc.
<b>3D Solutions</b>	Companies that provide real-time 3D visualization or supply such framework with a focus on precision in healthcare. They work to	Align Technology Inc.

	enhance quality-of-life using 3D technologies, surgical planning and personalized medical solutions.	
<b>Digital Healthcare</b>	Companies that are involved in developing remote patient monitoring systems and software to assist doctors and empower patients.	Boston Scientific Corporation
<b>Artificial Intelligence</b>	Companies that are involved in developing applications, technologies and products that utilize artificial intelligence for data analysis and patient monitoring	DexCom, Inc.

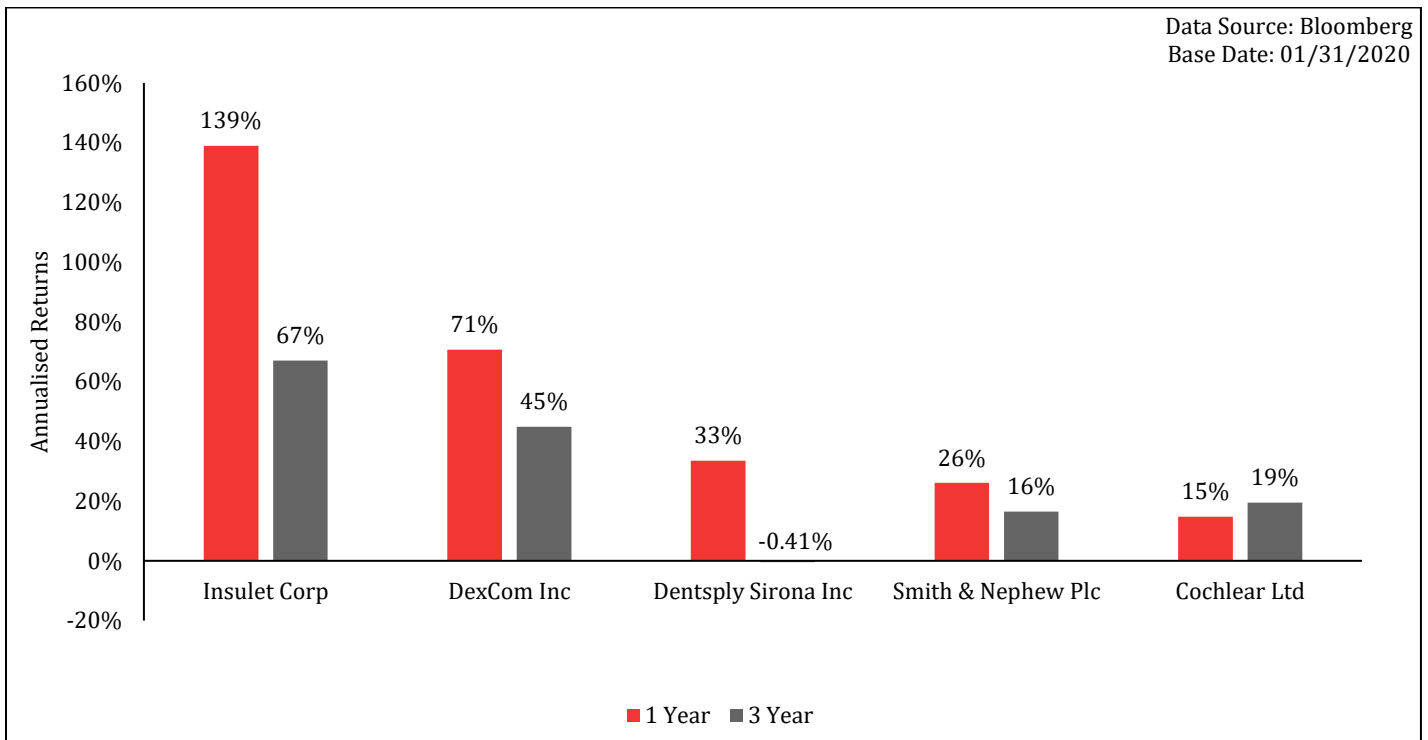
### 7.3 Healthcare Innovation Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>Intuitive Surgical, Inc.</b>	One of the first companies to enter the area of ‘robotic-assisted surgery’. Engages in the development, manufacturing, and marketing of da Vinci Surgical Systems, and related instruments and accessories that has been categorized as the advanced generation of surgery. Key factors leading to the growth of the company are greater potential demand for robotics surgery, aging population, and its increasing investment into the research & development of robotics surgery space.
2.	<b>DexCom, Inc.</b>	A medical device manufacturing company that engages in the design, development, and commercialization of continuous glucose monitoring systems for ambulatory use by people with diabetes.
3.	<b>Boston Scientific Corporation</b>	Has cloud-based, data-driven digital solution that will become part of their growing ADVANTICS™ portfolio of innovative healthcare solutions. Engages in the development, manufacture and marketing of medical devices that are used in interventional medical specialties.
4.	<b>Align Technology, Inc.</b>	iTero, engineered by Align Technology, Inc. captures 6,000 frames per second, and the image sensor is designed to enable scan speeds that are up to 20x faster than the current iTero scanner, resulting in a real-time 3D visualization of the digital scan – ready in just minutes for viewing on a multi-touch screen.
5.	<b>ABIOMED, Inc.</b>	Engages in the research, development, and sale of medical devices to assist or replace the pumping function of the failing heart.
6.	<b>Smith &amp; Nephew Plc</b>	Engages in the development, manufacture, marketing, and sale of medical devices that offers services like sports medicine joint repair; arthroscopic enabling technologies; trauma and extremities; other surgical businesses; knee and hip implants.
7.	<b>William Demant Holding A/S</b>	Develops, manufactures and sells products and equipment designed to aid the hearing and communication of individuals.



8.	<b>Dentsply Sirona, Inc.</b>	Engages in the design, manufacture, sales, and distribution of professional dental products and technologies. It operates through the Technologies and Equipment and Consumables segments.
9.	<b>Cochlear Limited</b>	Provides implantable hearing solutions.
10.	<b>DiaSorin S.p.A.</b>	Develops, produces and markets reagent kits for in vitro diagnostics. It specializes in the provision of immunodiagnostics and molecular diagnostics solutions

#### 7.4 Top 5 Healthcare Innovation Companies in The Index based on highest Trailing 12 Month Returns



## 8. Internet of Things

### 8.1 Introduction to Internet of Things

Internet of Things (IoT) is a system of interrelating and connecting objects to the Internet. The objects may include computer interrelated devices, digital machines, mechanical machines, animals, and even people that are provided with unique identifiers. IoT can transfer data over a network without requiring human to human or human to computer interaction.

IoT is driven by real time applications ranging from consumer IoT and enterprise IoT to manufacturing and industrial IoT. The most common applications used are Application Programming Interfaces (APIs), big data management tools, predictive analysis, machine learning and artificial intelligence. It enables companies to rethink the ways they approach their business, industries and markets and give them tools to improve their business strategies.

The growth in the adoption of IoT can be attributed to wireless technologies, reduction in cost of connected devices, advances in data analytics and data processing, and increases in cloud platform adoption. Though still in its early stage of adoption, IoT has touched every vertical of industry and there is more yet to come.

- The overall IoT market is expected to grow from \$170.57 billion in 2018 to \$561.04 billion in 2022, a CAGR of 26.9%.<sup>27</sup>

IoT has the potential to connect and monitor all objects that interact with each other on the Internet. IoT has already helped corporations and businesses in numerous ways, such as:

- Improved decision making and enhanced customer service.
- Integrated business models to improve productivity.
- Monitoring the overall business processes across supply chains or business groups.

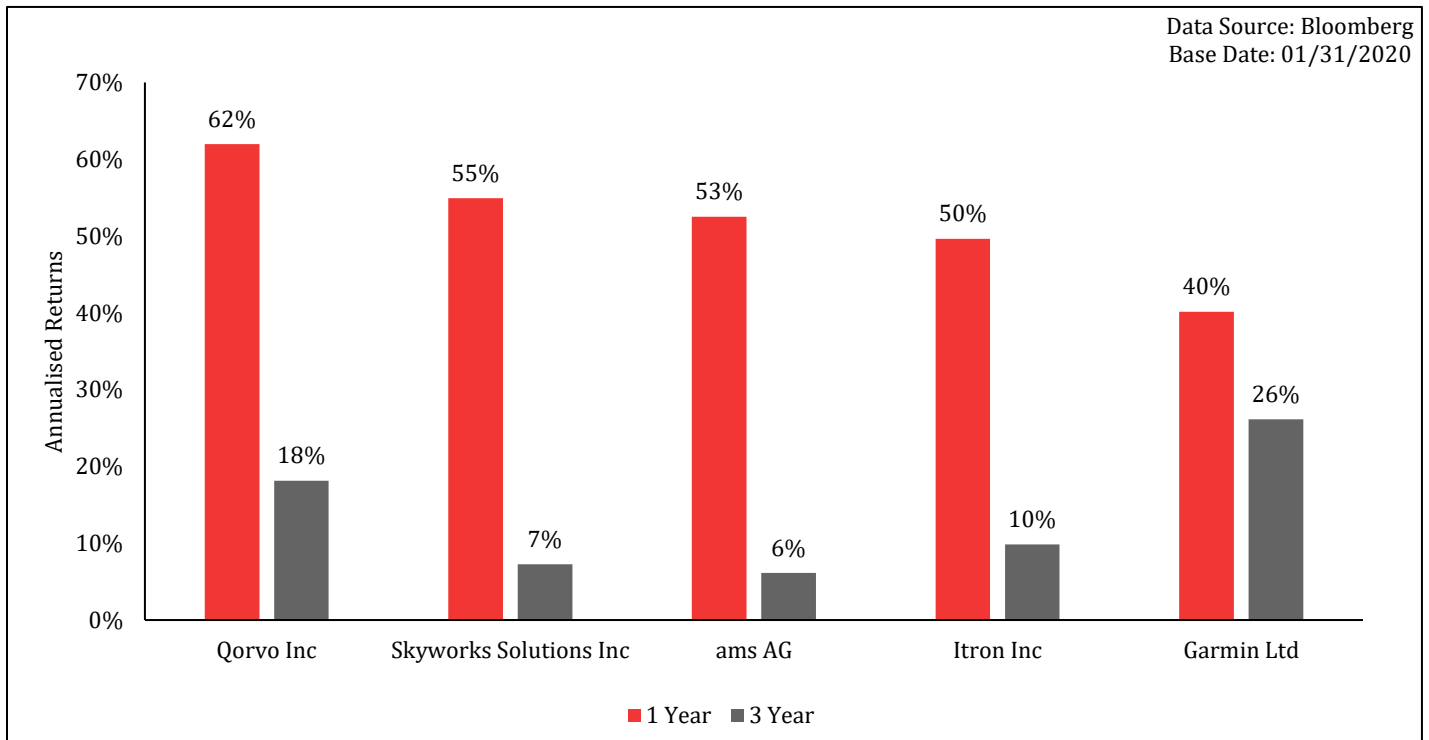
### 8.2 Internet of Things Innovations Included in The Index:

Innovations in Internet of Things	Description	Examples of Listed Companies
<b>Semiconductors and Sensors</b>	Companies that develop and manufactures semiconductors and sensors which are inbuilt with IoT applications that help in extracting and manipulating data with connected devices.	Skyworks Solutions, Inc. Sensata Technologies Holding Plc
<b>Networking Infrastructure/Software</b>	For industrial and governmental applications, not limited to smart grids, and does not include companies which are primarily consumers of industrial IoT products and services.	AMS AG Itron, Inc.
<b>Equipment, Vehicle and Infrastructure/Building Technology</b>	Consumer applications but not limited to smart security, smart home solutions, and wearable connected devices and does not include companies which incorporate IoT solutions as a minor component or value-added feature in their products.	Alarm.com Holdings, Inc.
<b>Consumer IoT technology</b>	Companies that are involved in developing and providing innovative solutions but not limited to smart security, smart home solutions and wearable connected devices excluding minor component or value-added feature in their products.	Qorvo, Inc. Garmin Ltd. Silicon Laboratories, Inc. ADT, Inc

### 8.3 Internet of Things Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>Alarm.com Holdings, Inc</b>	Creates innovative technology that builds a relationship between people and things in providing security and smart home solutions. Centered on security and remote monitoring, the Alarm.com platform addresses a wide range of market needs and enables application-based control for a growing variety of IoT devices.
2.	<b>Silicon Laboratories, Inc</b>	Provides solutions for smart based home solutions and security management.
3.	<b>Itron, Inc.</b>	Delivers innovative, secure networked solutions including communication devices, network infrastructure, and associated application software to 8,000+ customers in more than 100 countries.
4.	<b>Qorvo, Inc</b>	For more than 30 years, Qorvo has been innovating, researching, developing cutting-edge technologies that shape the world. A leading provider of innovative RF solutions that connect the world. In 2018, partnered with LEEDARSON to launch a family of smart home lighting solutions that support multiple standards for the IoT.
5.	<b>Garmin Ltd.</b>	Offers a range of products designed for use in fitness and activity tracking. Garmin Connect helps in tracking, analyzing and sharing health and fitness activities from a Garmin device.
6.	<b>Skyworks Solutions, Inc</b>	Strong force in empowering wireless networking. Has strong historical fundamentals for return on equity, market crash recovery, return on invested capital, and gross margin percent, and further potential room for growth.
7.	<b>Sensata Technologies Holding Plc</b>	A supplier of sensors and controls across a broad range of markets and applications. Their devices meet the growing demand of markets and provide customized solutions.
8.	<b>AMS AG</b>	Designs and manufactures advanced sensor solutions for applications requiring small form factor, low power, highest sensitivity and multi-sensor integration. Products include sensors, sensor ICs, interfaces and related software for mobile, consumer, communications, industrial, medical, and automotive markets.
9.	<b>Landis+Gyr Group AG</b>	Specializes in metering solutions for electricity, gas, heat/cold and water for energy measurement solutions for utilities. The Company's product portfolio consists of advanced metering and intelligent energy management products, such as electricity meters, heating and cooling meters, grid management solutions, personal energy management solutions
10.	<b>ADT, Inc</b>	Provides residential and small business electronic security, fire protection and other alarm related monitoring services.

### 8.4 Top 5 Internet of Things Companies in The Index based on highest Trailing 12 Month Returns



## 9. Mobile Payments

### 9.1 Introduction to Mobile Payments

Mobile payments are a modern method of facilitating transactions. Mobile payments convert a traditional cash-operational society to a cashless one. It includes numerous forms of new-age payment channels that function through the Internet or near-field communication (NFC) payment processes. Mobile payments encompass everything from transferring funds to paying for goods at brick and mortar stores to making payments online. Transactions require the use of an electronic device, but do not always require the physical presence of a traditional form of payment such as cash or credit/debit cards.

Mobile Payment solutions provide a seamless system of conducting transactions without the need of cash. The mobile payment industry consists of the following:

- Payment infrastructure providers
- Payment processing services
- E-wallets
- Credit card and debit card networks

Mobile payment companies are providers of payments solutions, payment processing services, credit card network or payment industry infrastructure and software services.

- Digital eWallets are forecast to have a market share of 17.0% by 2026.<sup>28</sup>
- The global digital payments market will reach \$132.5 billion by 2025, the result of a compound annual growth rate of 17.6%.<sup>29</sup>

Due to the evolution of mobile payments, customers no longer need to be physically present to make a transaction. This enables customers to make payments from any part of the world. Mobile payments also bring the advantage of budgeting to its users as the user's payment data is stored and can be tracked easily. The advantages of mobile payments are as follows:

- More convenient and easily accessible
- Easily traceable
- Lower risk

### 9.2 Mobile Payments Innovations Included in The Index:

Innovations in FinTech	Description	Examples of Listed Companies
<b>Digital Payment Infrastructure and Software Providers</b>	Companies that provide hardware or software services for transacting payments across different channels. This could include point-of-sale, mobile, or even online transactions.	Global Payments, Inc.
<b>Digital Wallet Companies</b>	A digital wallet is a system that securely stores users' payment information and passwords for numerous payment methods and websites. By using a digital wallet, users can complete purchases easily and quickly with near-field communications technology. Digital wallets can be used in conjunction with mobile payment systems, which allow customers to pay for purchases with their smart phones.	

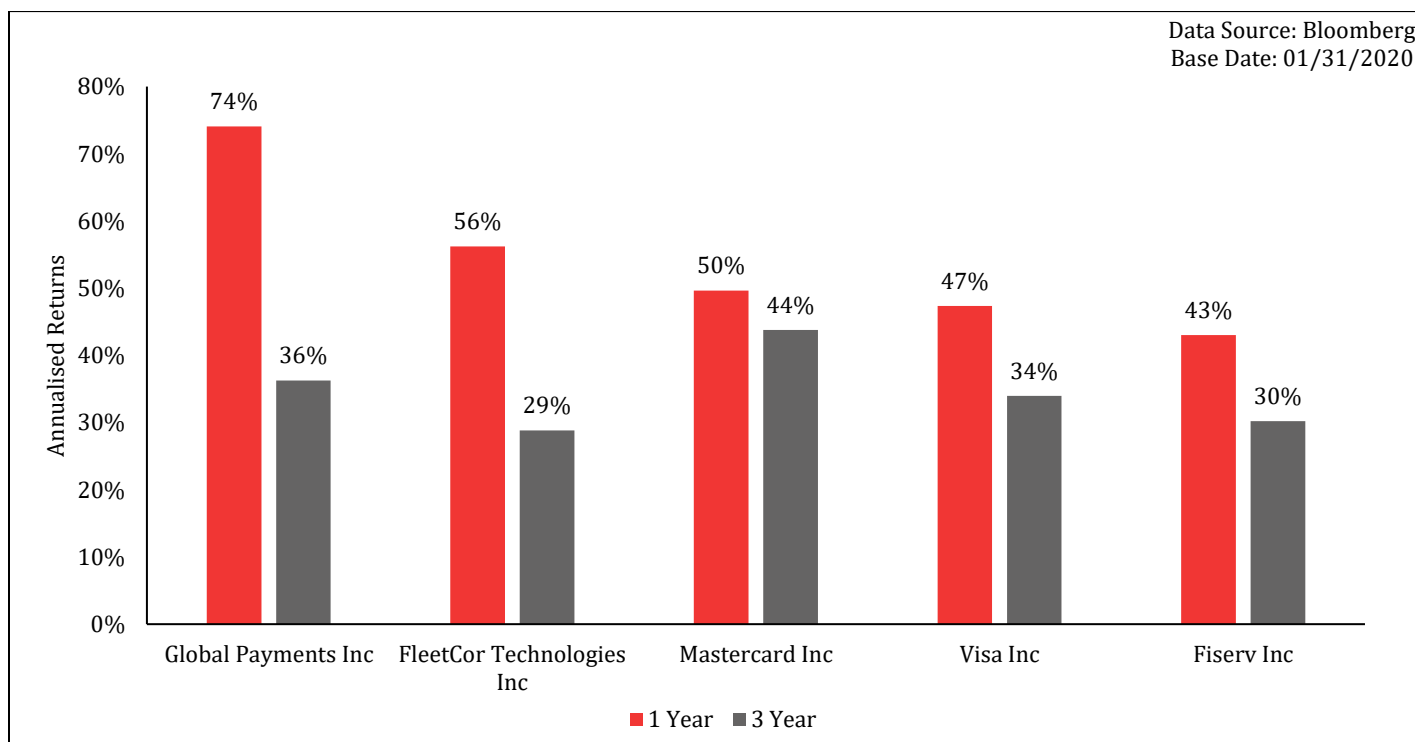
<b>Digital Payment Processing Services Providers</b>	<p>Companies that handle front end and back end transactions and processing from various channels, such as credit cards, debit cards, or point-of-sale payments. Processors are an important link between various merchants and issuing banks as they help to communicate and relay information as to whether the transaction is going to be approved or denied.</p>	<p>PayPal Holdings, Inc.          Visa, Inc.          Mastercard, Inc.</p>
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### 9.3 Mobile Payments Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>Visa, Inc.</b>	<p>Visa’s credit and debit cards are accepted almost universally. The company has connected 500 million previously unbanked individuals to Visa accounts from 2015 to 2019. Since it has a large number of co-branding partners, its total cards in circulation and transaction volumes exceed those of its rivals and promote its growth outlook.</p>
2.	<b>Mastercard, Inc.</b>	<p>Offers payment solutions that enables the development and implementation of credit, debit, prepaid, commercial, and payment programs and solutions. It operates as the world’s fastest payment processing network, connecting consumers, financial institutions, merchants, governments and businesses in more than 210 countries and territories</p>
3.	<b>PayPal Holdings, Inc.</b>	<p>Develops technology platform for digital payments. PayPal benefits from a big network effect, as it has access to over 200 markets and over 250 million customers. Customer growth has continued to accelerate with new active accounts increasing 18% year over year in the third quarter of 2018.</p>
4.	<b>American Express Co.</b>	<p>Is a globally integrated payments company that provides customers with access to products, insights and experiences that enrich lives and build business success. For the year ended December 31, 2019, worldwide proprietary billed business (spending on American Express cards) was \$1,071 billion and the company had 70 million proprietary cards-in-force worldwide.</p>
5.	<b>Fiserv, Inc.</b>	<p>A global leader in financial services technology solutions. Helps more than 12,000 clients worldwide create and deliver experiences for a digital world. Fiserv has been a part of the Fortune 500 list since 2016.</p>
6.	<b>Square, Inc.</b>	<p>Aggregates merchant services and mobile payments into a single, easy-to-use service. As of December 31, 2019, its peer to peer transfer service, Cash App had stored balances of \$676 million from its customers, representing an increase of 102% year over year.</p>
7.	<b>Adyen NV</b>	<p>Provides integrated platform for the delivery of products and services on a global scale with local capabilities, directly connecting merchants to Visa, Mastercard and many other payment methods. In the second half of 2019, it processed €135 billion, up 52% year-on-year.</p>

8.	<b>Wirecard AG</b>	Is one of the world's leading independent providers of outsourcing and white label solutions for electronic payment transactions. In Q3 2019, it reported a 38% Year-on-Year growth in transaction volume.
9.	<b>Global Payments, Inc.</b>	A leading worldwide provider of payment technology and software solutions delivering innovative services to our customers globally. Headquartered in Georgia with over 24,000 employees worldwide, Global Payments is a member of the S&P 500 with worldwide reach spanning over 100 countries throughout North America, Europe, Asia Pacific and Latin America.
10.	<b>FleetCor Technologies, Inc.</b>	Specializes in providing payment solutions that help businesses control, simplify, and secure payment for fuel, general payables, toll and lodging expenses. It operates in more than 50 countries and reported a revenue of \$2.6 billion in 2019.

#### 9.4 Top 5 Mobile Payments Companies in The Index based on highest Trailing 12 Month Returns



## 10. Robotics & Artificial Intelligence

### 10.1 Introduction to Robotics & Artificial Intelligence

Artificial Intelligence (AI) is the science and engineering of making intelligent machines, especially intelligent computer programs. It is an umbrella term that refers to information systems inspired by biological systems, and encompasses multiple technologies including machine learning, deep learning, computer vision, natural language processing (“NLP”), machine reasoning, and strong AI. The potential reach of AI is enormous.

AI is expected to touch most industries one way or another, significantly improving productivity, cutting costs and providing a competitive advantage. Robotics and AI augment and amplify human potentials, increase productivity and are moving from simple reasoning towards human-like cognitive abilities.

AI refers to the ability of a computer or a computer-enabled robotic system to process information and produce outcomes in a manner similar to the thought process of humans in learning, decision making and solving problems.

- The artificial intelligence market is expected to grow from \$21.46 billion in 2018 to \$190.61 billion by 2025, a CAGR of 36.62%.<sup>30</sup>
- In 2020, spending on robotics and drones is expected to total about \$128.7 billion. China is expected to be one of the largest markets for robotics and drones by 2023.<sup>31</sup>

AI has the potential to disrupt practically every industry imaginable, and industrial robotics is no different. The powerful combination of robotics and AI or machine learning are opening the door to entirely new automation possibilities. The long-term objective of AI is to create systems that demonstrate the adaptability of human intelligence across different domains. This will enable AI systems to transfer knowledge from one domain to another and interactively learn from humans.

Major applications of Robotics & Artificial Intelligence are as follows:

- **Agricultural Robots:** Companies are developing and programming autonomous robots to handle essential agricultural tasks such as harvesting crops at a higher volume and faster pace than human laborers.
- **Healthcare:** AI is being used to detect diseases, such as cancer, more accurately and earlier. The proliferation of consumer wearables and other medical devices combined with AI is also being applied to oversee early-stage heart disease, enabling doctors and other caregivers to better monitor and detect potentially life-threatening episodes at earlier, more treatable stages.
- **Transportation:** Fully autonomous vehicles, or self-driving cars, will be hitting the road in the next few years. Self-driving cars will gain even more popularity as Uber plans to acquire 24,000 autonomous Volvo SUVs.<sup>32</sup>
- **Finance:** Many financial services companies are turning to AI to keep up with an increasing amount of financial data. Robots can use predictive systems and market data to forecast stock trends and manage finances, more efficiently than humans.

### 10.2 Robotics & Artificial Intelligence Innovations Included in The Index:

Innovations in Robotics & Artificial Intelligence	Description	Examples of Listed Companies
<b>Industrial Robots and Automation</b>	Companies that provide robots and robotic automation products and services with a focus on industrial applications.	ATS Automation Tooling Systems, Inc. KEYENCE Corp. Cognex Corp. OMRON Corp.



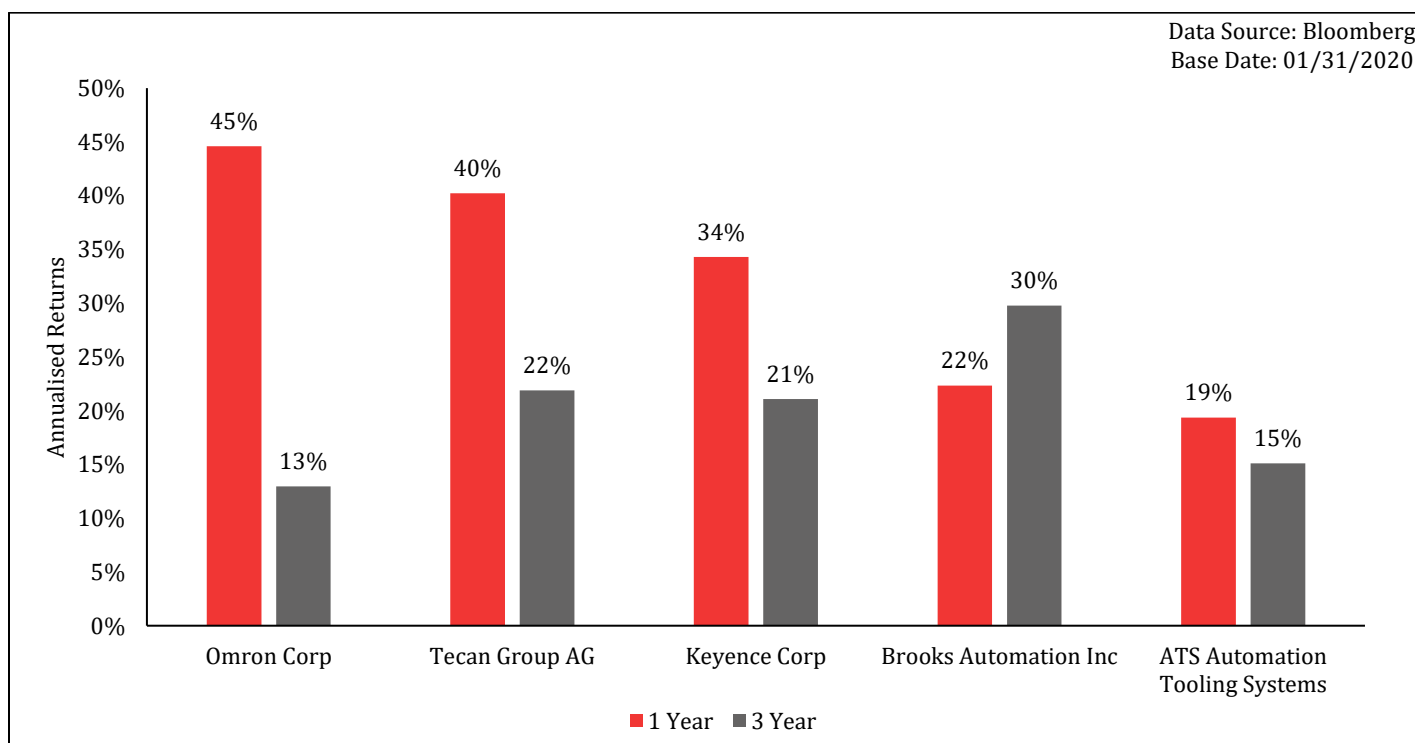
<b>Unmanned Vehicles and Drones</b>	Companies that are involved in the development and production of unmanned vehicles (including hardware and software for autonomous cars), drones and robots for both military and consumer markets.	AeroVironment, Inc.
<b>Non-industrial Robotics</b>	Companies that are engaged in developing robots and AI that are used for non-industrial applications, including but not limited to agriculture, healthcare, consumer applications and entertainment.	iRobot Corp.
<b>Artificial Intelligence</b>	Companies developing applications, technologies and products that utilize AI for data analysis, predictive analytics, task automation and other applications.	FANUC Corp.

### 10.3 Robotics & Artificial Intelligence Companies in The Index:

S.No	Company	Reason for Inclusion
1.	<b>Tecan Group AG</b>	Leading global provider of automated laboratory instruments and solutions. Tecan's Trio RNA-Seq™ library preparation solution is a revolutionary approach to pathogen identification from low-input samples, delivering augmented information on viral abundance, mutation, spectrum surveillance and gene expression. Researchers from Wuhan University, China, used the Trio RNA-Seq Library Preparation Kit to sequence virus genomes from limited COVID-19 patient samples. The genomes of SARS-CoV-2 were successfully analyzed to determine its origin, evolutionary history and virulence.
2.	<b>AeroVironment, Inc.</b>	Develops small unmanned vehicles for both military and commercial applications. The firm's military products include tactical unmanned aerial vehicles (UAVs) that can be launched and operated by one soldier in as little as five minutes. These UAVs are capable of streaming video for intelligence gathering and surveillance.
3.	<b>ATS Automation Tooling Systems, Inc.</b>	A world leader in factory automation solutions. Has designed and built more than 10,000 automation systems for many of the world's foremost manufacturers in areas as diverse as telecommunications, semiconductor, fiber optics, automotive, computers, solar energy and consumer products.
4.	<b>iRobot Corp.</b>	Engages in the business of designing and building robots. Develops proprietary technology incorporating advanced concepts in navigation, mobility, manipulation and artificial intelligence to build robots.
5.	<b>Brooks Automation, Inc.</b>	Manufacturing and supporting innovative automation solutions for the semiconductor industry for more than 30 years. A leading provider of reticle management solutions, with a bare reticle stocker system that can store up to 2,880 reticles and provide inspection and pod transfer capabilities.
6.	<b>KEYENCE Corp.</b>	Makes various sensor, scanner, safety, and controller devices that are critical to automation systems.

7.	<b>Cognex Corp.</b>	The world's leading provider of vision systems, software, sensors, and industrial barcode readers used in manufacturing automation. Helps companies improve product quality, eliminate production errors, lower manufacturing costs, and exceed consumer expectations for high quality products at an affordable price.
8.	<b>FANUC Corp.</b>	Has developed AI Feed Forward as the first to come out of its development efforts in a group of AI Servo Tuning functions that realize high-speed, high-precision, high-quality machining. Utilizes machine learning to easily tune parameters for controlling servo motors in a sophisticated manner.
9.	<b>OMRON Corp.</b>	Has a recognized heritage of influence and innovation. The company invented the first automated cash dispenser, automated traffic control systems, facial recognition sensing and a distance warning system for automobiles and is the global market leader in home blood pressure monitoring technology.
10.	<b>CYBERDYNE, Inc.</b>	A Japanese robotics and technology company. The company's products comprise of medical robots, personal care robots, work support robots.

#### 10.4 Top 5 Robotics & Artificial Intelligence Companies in The Index based on highest Trailing 12 Month Returns



## End Notes

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