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SPOTLIGHT

Age of Cybersecurity

Spend to defend

As cyber attacks on states, companies and individuals grow, spending on security is set to rise rapidly

But there is a potential underspend in cybersecurity despite the heightened risks to industry and governments

We explore the cybersecurity ecosystem and examine ESG, financial, and reputational issues at stake

Play video with Davey Jose

This is an abridged version of a report by the same title published on 29-Apr-21. Please contact your HSBC representative or email AskResearch@hsbc.com for more information.

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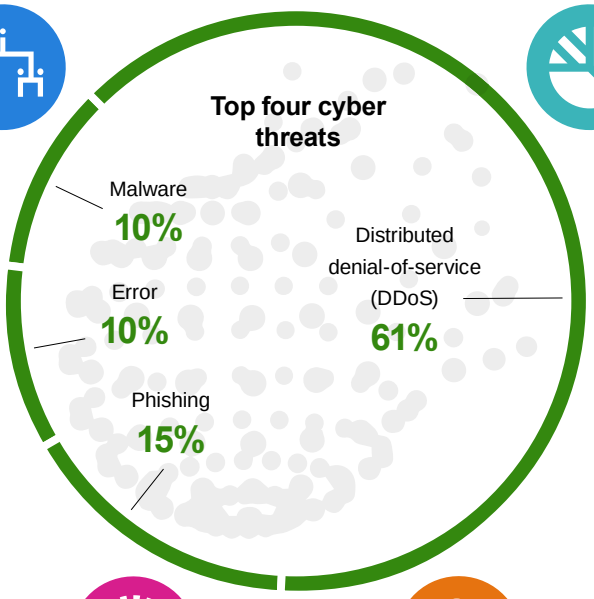
Cybersecurity and investor insights

Digitisation implies investment opportunities in the value chain

Cloud – as industries become further digitised, cyber security products follow suit

Governance – firms are experiencing more severe cyber attacks, resulting in significant financial and reputational damage

Financial – cyber attacks and data breaches can have significant impacts on a company, both from a financial/ operational perspective and via stock market moves



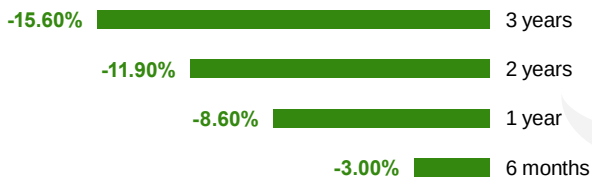
Social – substantial disruption and stress for individuals involved because of stolen data or loss of confidence in digitisation and technology

Enterprise – the security market space is fragmented and competitive. Global and regional players supply network security and services to multiple sectors

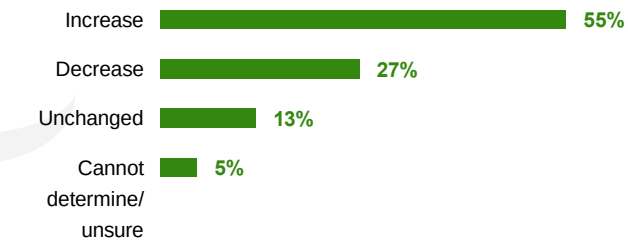
Environment – threats pose a significant challenge for utilities with pressure on efficiency rather than data breaches

Governments – become more efficient and offer enhanced digital services to continue to strengthen security

Average underperformance of a NASDAQ-listed company following a data breach announcement



Cybersecurity budgets are set to increase in 2021



Facts and figures

USD10.5trn

Annual costs of global cyber crime by 2025, up from USD3trn in 2015

14.5% CAGR

Global cybersecurity spend set to grow between 2020 and 2026

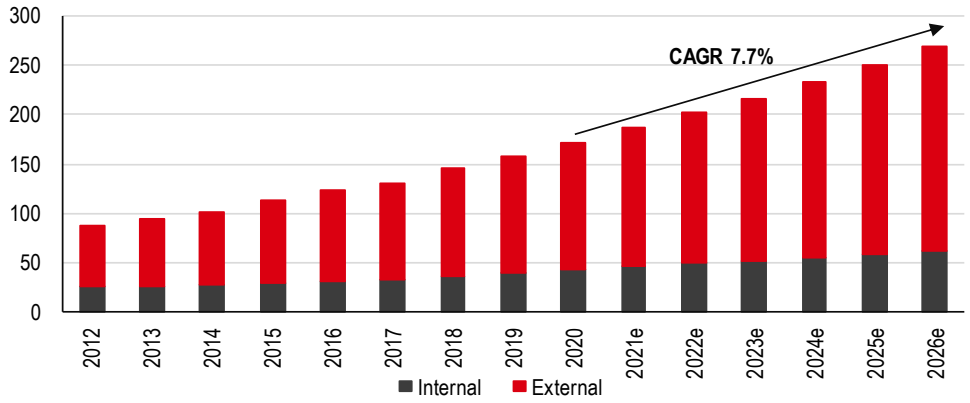
USD20bn

Global cyber insurance market set to grow by 2025 (from USD7bn)

Source: HSBC, Comparitech, Cybersecurity Ventures, Verizon, Munich Re

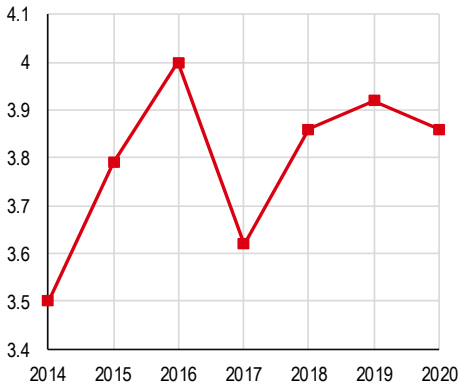
Age of Cybersecurity in charts

Chart 1. Global cybersecurity spend: projected CAGR 7.7% 202026 (USDbn annually)



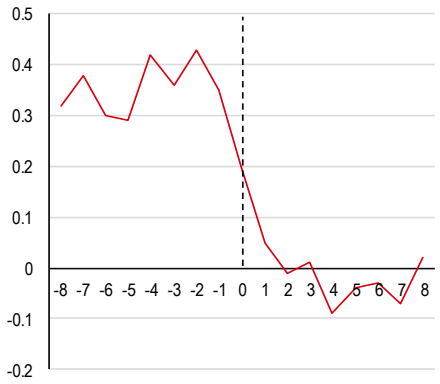
Source: HSBC, Cybersecurity Intelligence

Chart 2. Average cost of a data breach has increased by over 10% since 2014 (USDm)



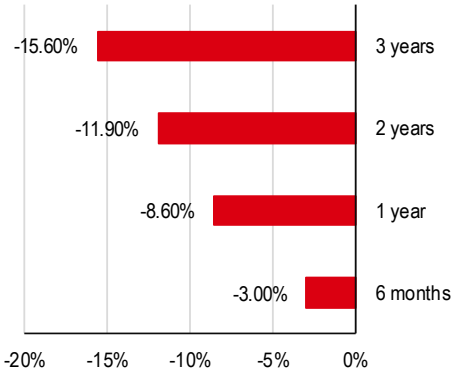
Source: Ponemon Institute.
NB. research across 524 organisations in 17 different industries.

Chart 3. Cyber breaches impact reputation of firms in quarters post data breach (2005-16) (y-axis: reputation rating*)



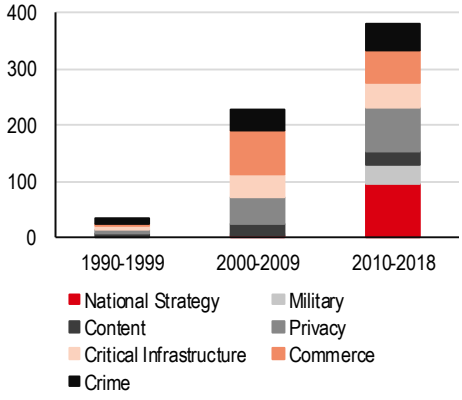
Source: Rotman School of Management, Note: * = reputation rating based on a number of reputation risk issues

Chart 4. Longer term, share prices underperform NASDAQ post data breach (2007-2020)



Source: HSBC, Comparitech

Chart 5. Cybersecurity regulations globally have increased tenfold since the 1990s



Source: HSBC, CSIS

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Age of Cybersecurity

- As digitisation of everything (DoE) grows, it will bring digital vulnerabilities, allowing global inflicted damages from cyber crime to grow from USD6trn to USD10trn by mid-2020s
- There is potential underspend in cybersecurity, but as country level regulations catch up, cybersecurity technology providers could benefit, with 14.5% cyber spend CAGR into the middle of the decade
- Cybersecurity will have ESG implications, via potential disruption to connected national infrastructure and emerging markets

Why do we need cybersecurity?

> **Shall we play a game?**
>
> **Joshua/WOPR in War Games (1983)**

From movies to reality

The 1980s motion picture War Games dramatised a worst-case scenario from hacking, leading to potential global thermonuclear war. Since the early days of largely unconnected computer systems in the 1980s, today almost everything is becoming increasingly connected to the internet, from your work computer and home smart fridge, to large industrial critical infrastructure. The importance of cybersecurity in a digital inter-connected world is clear: to protect these interconnected systems from a variety of digital attacks, thus safeguarding the day to day functioning of the global economy.

Growth of digitisation implies cybersecurity investment opportunity

Physical to digital security

Security technologies have played an important role in preventing harm to various aspects of the operation and functioning of civilisation for eons. One could suggest that security technology has evolved from being purely physical in the past to more digital in the data-centric world in which we now reside. Society and industry have gone from being protected by physical walls around cities to having invisible digital firewalls on our computers in the 21st century.

Plenty of digital growth upside in 2020s…

As our global economy becomes more digital, inter-connected and networked, the threats posed to nation states and industry by various entities will only increase. Even though it feels like technology is everywhere today, the world isn't fully digitised yet. Only 30% of software currently resides in the cloud, only 5% of warehouses are deemed fully automated, only 5% of factories are "smart" and only 20% of payments are through digital wallets so far. These digitisations are only set to grow over the coming decade.

A positive for those providing cybersecurity products, solutions and services

Even with this current level of digitisation, in 2021, cyber crime is still estimated to cost a total of USD6 trillion in inflicted damages – equivalent in size to the third largest economy after the US and China. Cyber crime inflicted damages are expected to grow to over USD10 trillion by 2025[1]. The threat of

1 Cyber crime costs include damage and destruction of data, stolen money, lost productivity, theft of intellectual property, theft of personal and financial data, embezzlement, fraud, post-attack disruption to the normal course of business, forensic investigation, restoration and deletion of hacked data and systems, and reputational harm. Cybersecurity Ventures, 2020

cyber crime can come from a multitude of sources including hackers, insiders, competitors, industrial spies, organised crime groups, nation states and terrorists. Moreover, cybersecurity spend is expected to grow up to 14.5% CAGR from 2020 to 2026. If digitisation numbers for various industries grow faster than expected, then we believe cyber crime opportunities could balloon further.

Key highlights

Below are some of the key takeaways from the full report. Please contact your HSBC representative or email AskResearch@hsbc.com for more information

- ***What is cybersecurity today?***

Types of cyber threats…

  - This section includes the fundamental types of cyber attack, real-world examples and the costs they inflict on an organisation. From malware to DNS tunnelling attacks, global cyber crime is expected to cost USD10.5 trillion globally in inflicted damages by 2025. With this, the rise in cybersecurity spending is expected to reach up to USD270 billion per annum by 2026. The impact of the COVID-19 pandemic has accelerated spending on cybersecurity, with over 50% of budgets increasing due to remote working environments and the increased challenges this brings for businesses.

Types of cybersecurity…

  - Types of cybersecurity are outlined, with companies that provide such services included. Over 50% of cybersecurity spending is on security services, including monitoring and managing security functions. Cybersecurity solutions for enterprises are examined in the section with the rise of Security Operations Centres, or SOC-as-a-Service (SOCaaS) companies and managed security services introducing automation and artificial intelligence. Additionally, the analysis of cybersecurity hardware, firmware and the evolution of payments is explored, with 63% of firms experiencing at least one breach due to vulnerabilities in hardware security and the impact of card-not-present transactions representing over 70% of card frauds across regions in 2019.

- ***Financial, stock market and insurance implications***

Financial costs from cyber attacks

  - It's probably not a surprise that cyber attacks and data breaches experienced by organisations can have significant impacts on a company, both from a financial and operational perspective and stock market moves. Therefore, it's important to understand fully the extent of such impacts. This section outlines the increasing costs of a data breach on organisations: with a 10% rise in costs since 2014, the average cost is currently USD3.86 million per breach. Real-world examples observe the number of records breached and the costs or fines faced by the companies. For example, Capital One were fined USD80 million for a data breach in 2019 that exposed 106 million customer accounts.

Reputational harm from cyber breaches

  - Not only is financial loss a significant impact of data breaches, but reputational damage can have long-term impacts on an organisation. On average, business reputation doesn't begin to recover until eight quarters following a data breach announcement.

Stock market and insurance implications from cyber incidents

  - Additionally, this section explores the stock market impact of data breaches, observing underperformance against stock market indices, such as the NASDAQ, on average down 15.60% in the three years following a data breach announcement. Observable is the variance of market reactions towards data breaches, with some companies experiencing significant falls in their stock prices, and others observing very little or no impact. Comparing sectors, on average finance experienced the greatest decline in stock prices, following an announcement, of -16.7% against the NASDAQ, in comparison to the technology sector, which averaged -2.9%. This begs the question as to whether companies should invest in cybersecurity solutions. This section explores this, with the expectation of increased fines and data breach notification laws, increasing the cost of cyber attacks on businesses and the impact on the stock market,

making investments worthwhile. With the development of cybersecurity solutions comes insurance for cyber attacks, with the market expected to grow 20-30% annually in the face of increasing digital threats, becoming a USD25bn market by 2025.

- ***Enterprise cybersecurity***

Types of enterprise cybersecurity companies

- Enterprise cybersecurity comprises firms that provide cybersecurity products and services, and those who consume them. We outline the competitive nature of the market for cybersecurity and the range of firms providing these services, with some very specialised in one sector, such as Fortified Health Security for the healthcare industry, or those broader providers such as Cisco, which service multiple industries. Financial Services is the sector most covered by the cybersecurity firms included in this report, with cloud security the most popular product provided by these firms.

Cybersecurity impacts by sector

- This section also drills down into specific sectors that consume cybersecurity products and services, with examples of those that provide these services. Healthcare has been particularly hit by cyber attacks in the last year, with a 60% increase in attacks globally since the start of the pandemic. The transport and logistics industries are facing increasing threats via the increased uptake of IoT devices, and the automotive sector is observing increased use of connected devices, with 67% of new cars in the UK connected to the internet, and expectations of 100% connection by 2026. The financial sector faces the most costs of a data breach on average. It has experienced a 54% increase in reported cyber incidents since the beginning of the pandemic; with the increase in remote working, physical security becomes a challenge also. We also analyse the cyber threats faced by the manufacturing, agriculture and government sectors in this section.

- ***State level cybersecurity***

The rise of cybersecurity spend in national defence budgets

- This chapter looks at the role of the state at a national level of cybersecurity. Globally, digitalisation has increased rapidly, which grows the threat of cyber attacks on infrastructure of national security importance. Therefore, defence budgets are increasingly including cybersecurity as a main feature and focus of resources. This section summarises cybersecurity spend where available for the regions included, as well as examples of key cybersecurity contracts awarded by national governments.

Who gains from national cyber spend?

- Governments' cybersecurity budgets are expected to increase. An example is the UK, where GBP1.5 billion extra will be injected into cybersecurity over the next four years. Some companies, such as Google, are beginning to reject government contracts owing to the misalignment of company principles for the use of such technologies.

National cybersecurity regulations

- Regulations of cyber and data breaches are moving forward around the world, which could put more pressure on companies to increase investment in cyber defence, as well as being important factors for investors

- ***Cyber breach case studies***

We highlight interesting cyber breach case studies

- This chapter outlines ten key examples of cyber breaches and their impact on the affected company's share price, with comparison to local stock market indices. We chose case studies via notable falls in share prices, such as the Equifax breach in 2017, which resulted in a 32% decline over the week following the cyber breach announcement, with the stock underperforming the S&P500 for the following nine months. Additionally, we look at case studies where a significant number of individuals were impacted, that included sensitive information, and which resulted in fines or substantial costs.

- One example is the Capital One breach in 2019, which impacted 106 million consumers, and included information such as credit card numbers. The company was fined USD80 million. The share price fell 6% and underperformed the S&P for four months; however, there was little change following the announcement of the fine.
- Case studies include charts illustrating the share price changes versus stock market indices including the CAC, S&P500 and FTSE100. Prices are based to 100 on the cyber breach announcement date, with two to three months prior and six to nine months post-breach to illustrate performance comparison.

ESG implications from cybersecurity

Naturally cybersecurity ticks all three components of ESG. These are the key ideas embedded within the report:

Connected national infrastructure could pose environmental issues if not protected

- **Environment** – In 2019, sPower, a Utah-based solar power energy generation provider, experienced a DDoS (distributed denial-of-service) attack, which disconnected the generation source with the power grid. Often hackers' aims are power shortages rather than stealing data, which highlights concerns over future attacks on renewables as regions become more reliant on them. By 2030, 54% of the electricity mix in Europe is expected to be renewable to meet targets[2].

  With the increased use of remote monitoring, intelligent connected devices and increased automation, cyber threats pose a significant challenge for utilities, especially with the pressure of efficiency of operations being a primary concern for companies. For example the renewable energy sector, which is expected to expand by 10% in 2021[3] could increasingly become a target for cyber attacks as it grows in importance to being a part of the infrastructure of nation states. Environmental concerns lie with attacks that can cause environmental damage or prevent organisations fulfilling operations.

  Sectors where we believe cybersecurity has environmental implications include agriculture, manufacturing and renewables. See the chapter *Enterprise cybersecurity*.

The elderly, enterprises and emerging markets link cybersecurity and other social risks

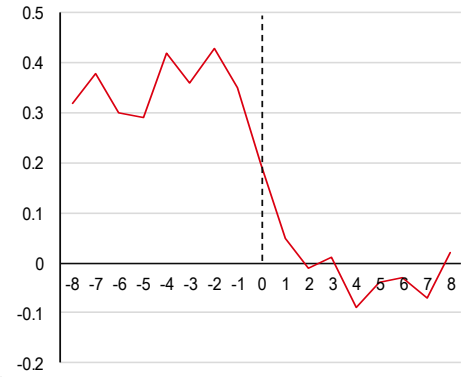
- **Social** – Impacts of cyber attacks can go beyond financial damage, with substantial disruption for individuals involved, whether it's the stress caused by stolen data or the loss of confidence in technology. As consumers, those impacted by a cyber attack experience disruption to daily life, especially when financial loss or interruption of essential resources such as energy is involved. The older population become particularly targeted, with those aged 55 and over losing around GBP3.7m between 2018 and 2019 due to cyber crime[4].

  From an enterprise point of view, there's the risk of employee demoralisation and reputational damage as a result of a cyber breach, Chart A1 illustrates the impact on firms' reputations, which on average, doesn't begin to recover until eight quarters post-breach.

  Less economically developed regions such as Africa are particularly vulnerable due to lack of cybersecurity infrastructure and knowledge. Cyber crime cost the continent USD3.5 billion in 2017, with a worrying 96% of cyber incidents unreported or unsolved[5]. Chart A2 includes countries within the region with particularly high cyber crime costs.

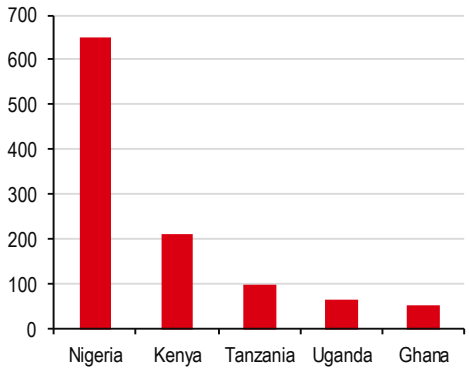
2 'Renewable technologies in the EU electricity sector: trends and projections', European Commission, 2017
3 'Renewables 2020', IEA, Nov 2020
4 'Uncovering the extent of cybercrime across the UK', Age UK, 2020
5 'Africa Cyber Security Report 2017', Serianu, 2017

Chart A1. Cyber breaches impact reputation of firms in quarters post data breach (2005-16) (y-axis: reputation rating*)



Source: Rotman School of Management, Note: * = reputation rating based on a number of reputation risk issues

Chart A2. Countries with significant cyber crime costs across Africa (USDm) (2017)



Source: HSBC, Africa Cyber Security Report

Cyber breaches are governance issues for enterprise, bringing long-term stock market impacts

- **Governance** – Increasingly, firms are experiencing cyber attacks at greater volumes and severity, resulting in significant financial and reputational damage. With fines and cyber breach notification regulations on the rise – such as the UK's DPA 2018 amendment increasing the maximum fine of GBP0.5m to GBP17.5m or 4% of turnover – cyber risk is progressively becoming a principal risk for corporations and their boards.

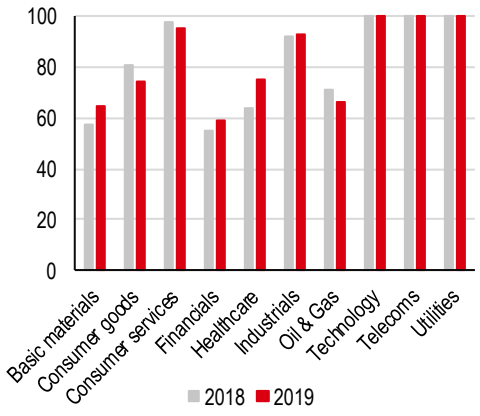
  In 2018, 89% of FTSE 100 companies disclosed an element of cyber risk as a principal risk to the delivery of their strategy in their annual reports. However, only 8% of boards had a Chief Information Security Officer (CISO) as part of their executive team[6].

  In addition, cyber risk has for a long time not been reflected in the typical composition of boards. More than one-third of the FTSE 350, who report technology and cyber security as a key risk to their business, do not have directors with relevant expertise on their boards. This rises to half or more when it comes to the oil and gas, consumer goods and financial sectors.[7] In an attempt to tackle this situation and improve risk oversight and mitigation, many sectors saw a rise in board appointments of directors with cyber or wider information technology expertise. However, this approach may not be effective for all companies as any appointment has to be considered against the other strategic demands of the business. We think the focus should be on strengthening bespoke training for the board and executive team and using other available resources, for example establishing advisory panels to enable effective strategic board conversations on cyber security issues.

  The impact of COVID-19 has intensified the need for focus on cyber security, with 70% of organisations stating that remote working increases the cost of a data breach and 76% stating that it would take longer to identify and contain such breach[8].

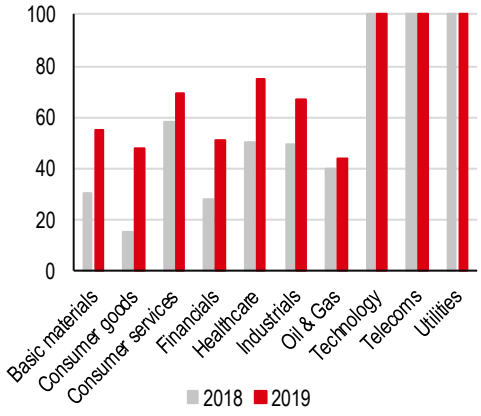
6 'Only 1 in 5 FTSE 100 firms have cyber risk testing programmes', Teiss, 28 March 2018
7 Grant Thornton Corporate Governance Review 2019
8 'Cost of a Data Breach Report', Ponemon Institute, 2020

Chart A3. % of companies disclosing technology as a key risk…



Source: HSBC, Grant Thornton Corporate Governance Review

Chart A4. …and % of those that have technology expertise on the board



Source: HSBC, Grant Thornton Corporate Governance Review

With cyber attacks potentially having significant impacts on share prices, investors are especially focused on cyber security as a critical aspect of company valuation. According to PwC and its Seven Principles for Governance of Cyber Security Risk, 73% of investors identified cyber security as an area of concern. With a growing number of data breach disclosure regulations being introduced, such as in Australia in 2018, the resulting public knowledge of cyber attacks could impact the stock market to greater effect than before.

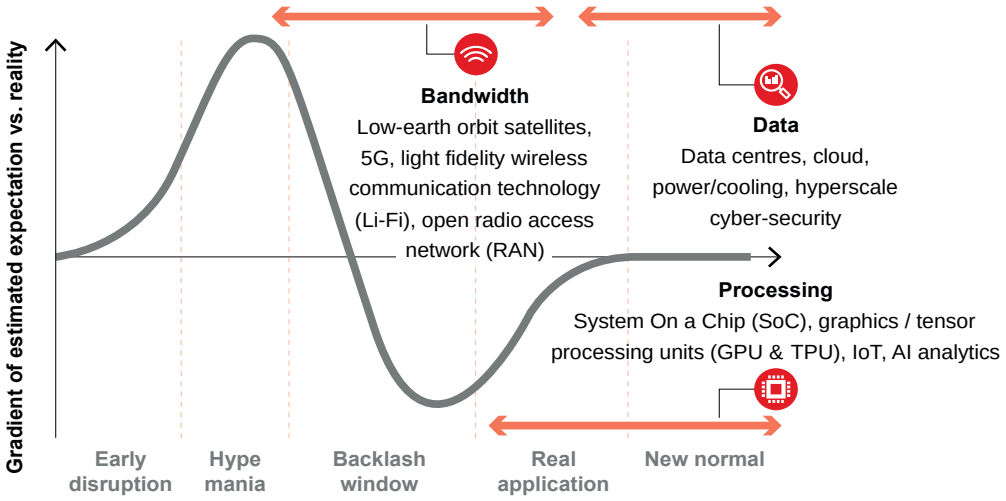
See chapters *Financial, stock market and insurance implications* and *State level cybersecurity* for more detail relating to cyber attacks and governance issues, for companies and countries.

HSBC Disruptive Framework and cybersecurity

Cybersecurity is in the "new normal" part of our disruption framework…

In our report *The Edge of Disruption* (22 November 2020), we outlined our four key disruptive technological themes (connectivity, automation, experiential and digital health) and explained why the pandemic has accelerated their adoption with industry and society. We also created the HSBC Disruption Framework for each of these themes, placing the different technologies in this framework to help investors understand how mature the innovation is and if it's ready to become the new normal, disrupt business models and have economic implications.

Chart A5. HSBC Disruption Framework: Connectivity infrastructure



Source: HSBC

This means cybersecurity is an essential part of enterprises and can generate significant revenues for technology providers

With the rise of data-centric businesses and the digital state, all connected, the value of data increases. It's estimated that there will be three internet of things (IoT) devices in existence for every person by next year.[9] At the same time, social commerce continues to rise, with more brands focusing on direct-to-consumer selling and relationships.

However, this also means there is the risk of bad actors trying to breach security and obtain data or take systems off-line. Bad actors can use these digital entry points to offer an expansive attack surface in the form of connected devices, digital storefronts and engagement tools.

Products, services and solutions for technology stack is in the "new normal" part of our framework, as cyber security is an essential part of businesses with connectivity. For consumer-focused organisations, this means a higher risk of data breaches and loss if the right protocols and technologies are not in place. As a result, we expect to see product and platform security come to the forefront next year, particularly as organisations realize the value that consumers place in trust, privacy, and security.

The next evolution of cybersecurity will be to deploy AI to automate security further – we suggest this is in the "real applications" stage of the framework, so not necessarily the main part of revenue generation for cyber yet.

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9 Cap Gemini

Disclosure appendix

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From 23rd March 2015 HSBC has assigned ratings on the following basis:

The target price is based on the analyst's assessment of the stock's actual current value, although we expect it to take six to 12 months for the market price to reflect this. When the target price is more than 20% above the current share price, the stock will be classified as a Buy; when it is between 5% and 20% above the current share price, the stock may be classified as a Buy or a Hold; when it is between 5% below and 5% above the current share price, the stock will be classified as a Hold; when it is between 5% and 20% below the current share price, the stock may be classified as a Hold or a Reduce; and when it is more than 20% below the current share price, the stock will be classified as a Reduce.

Our ratings are re-calibrated against these bands at the time of any 'material change' (initiation or resumption of coverage, change in target price or estimates).

Upside/Downside is the percentage difference between the target price and the share price.

Prior to this date, HSBC's rating structure was applied on the following basis:

For each stock we set a required rate of return calculated from the cost of equity for that stock's domestic or, as appropriate, regional market established by our strategy team. The target price for a stock represented the value the analyst expected the stock to reach over our performance horizon. The performance horizon was 12 months. For a stock to be classified as Overweight, the potential return, which equals the percentage difference between the current share price and the target price, including the forecast dividend yield when indicated, had to exceed the required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). For a stock to be classified as Underweight, the stock was expected to underperform its required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). Stocks between these bands were classified as Neutral.

*A stock was classified as volatile if its historical volatility had exceeded 40%, if the stock had been listed for less than 12 months (unless it was in an industry or sector where volatility is low) or if the analyst expected significant volatility. However, stocks which we did not consider volatile may in fact also have behaved in such a way. Historical volatility was defined as the past month's average of the daily 365-day moving average volatilities. In order to avoid misleadingly frequent changes in rating, however, volatility had to move 2.5 percentage points past the 40% benchmark in either direction for a stock's status to change.

Rating distribution for long-term investment opportunities

As of 29 April 2021, the distribution of all independent ratings published by HSBC is as follows:

Buy	58%	(29% of these provided with Investment Banking Services)
Hold	34%	(28% of these provided with Investment Banking Services)
Sell	8%	(25% of these provided with Investment Banking Services)

For the purposes of the distribution above the following mapping structure is used during the transition from the previous to current rating models: under our previous model, Overweight = Buy, Neutral = Hold and Underweight = Sell; under our current model Buy = Buy, Hold = Hold and Reduce = Sell. For rating definitions under both models, please see "Stock ratings and basis for financial analysis" above.

For the distribution of non-independent ratings published by HSBC, please see the disclosure page available at http://www.hsbcnet.com/gbm/financial-regulation/investment-recommendations-disclosures.

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