



Executive
Perspectives

The CEO's Guide to Cybersecurity

September 2021



BCG Executive Perspectives

IN THIS DOCUMENT

CYBERSECURITY HAS BECOME INCREASINGLY PRESSING

Even prior to the COVID-19 pandemic, the global cost of cyber crime had been surging. The frequency and severity of cyber attacks continues to accelerate as cost per attack decreases and defense requirements rise. During the pandemic, the cyber attack surface has further expanded. Due to a large increase in the number of people working from home and a spike in digital adoption broadly, there has been a rise in unsecured technologies (e.g., networks, devices, platforms) and accompanying processes. Attackers have seized the chance to exploit new vulnerabilities in unprepared workforces.

CEOS CAN SPEARHEAD CYBERSECURITY STEP CHANGE

Cybersecurity is often viewed as an intimidating topic and a purely technical issue. But it is not only up to the IT department or the chief information security officer (CISO) to defend against malicious actors. CEOs, boards, and the C-suite need to strengthen cybersecurity programs and integrate them into broader strategies. They must ask challenging questions, hold leaders accountable, and ensure everyone is trained on appropriate protocols. A well-functioning cyber program not only helps protect crown jewels but can also be a strategic differentiator.

Cybersecurity has become an increasingly pressing issue of greater scale

Rising costs

~\$2T

Estimated cost of **cyber crime** by end of 2021, up from ~\$400B in 2015

Increasing impact

\$265B

Estimated global cost of **ransomware damage** in 2031, up from \$20B in 2021 as attacks increase in **frequency** and **severity**, which can affect operations

Human error

77%

Of cyber attacks are due to **human** and **not technological failures**

Protection gaps

84%

Of companies do not effectively mitigate **third-party cyber risks**

Quantum future

5-10

Years before **quantum computing** potentially becomes **commercially available**, overturning today's encryption standards

As COVID-19 expedites digital connections and increases cyber risks, the breadth of impacts from cyber attacks also expands

Examples of potential wide-reaching cyber impacts

Illustrative



Summary

The CEO's Guide to Cybersecurity

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CYBERSECURITY TRENDS

- 1 Global cost of cyber crime is rising precipitously, driven by lower cost to execute attacks and higher complexity to defend; public and private sectors struggle to respond
- 2 As pandemic drives massive increase in digital/devices, cyber attacks are rising even more
- 3 Most cyber attacks are due to human failures (e.g., people, processes) rather than technology
- 4 Cyber risks are beyond financial (e.g., operations) and can threaten an organization's existence and even human safety (e.g., attacks on infrastructure/machinery, health care)
- 5 As supply chains become more digital and complex, they are increasingly targeted for attacks
- 6 Quantum computing may be widespread in 5-10 years, leading to overhaul of cyber standards

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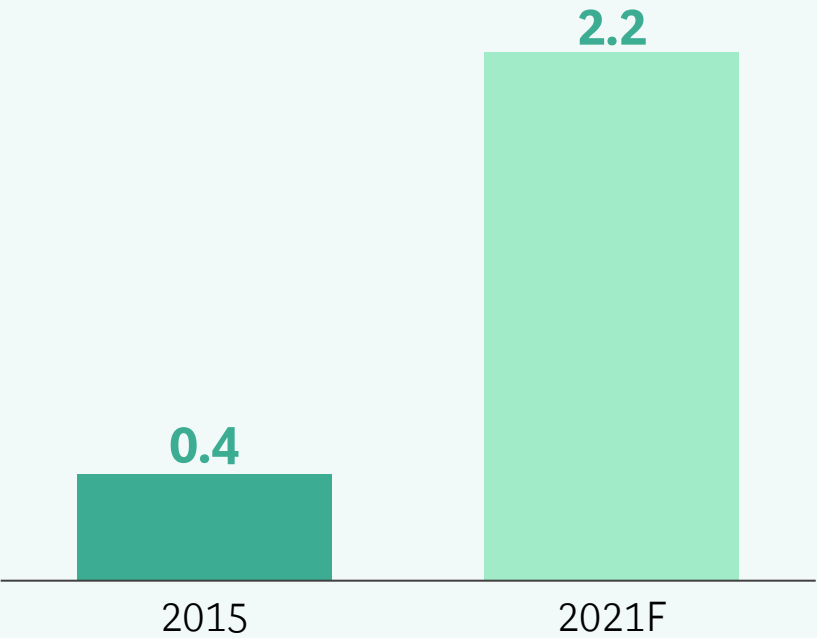
IMPLICATIONS FOR LEADERS

- Critical for CEOs to set cyber ambition and integrate cybersecurity into business processes/strategy
- 1 Orient organization's cyber ambition relative to industry peers and investment ability
 - 2 Rethink prevention and detection of near-term attacks; build cyber into business strategy
 - 3 After a breach, leaders must collaborate to notify third parties, investigate, and communicate
 - 4 Future-proof cybersecurity by considering increased risk from emerging/new technologies and behavior changes

1.1 A Global cost of cyber crime is projected to rise from \$445B in 2015 to \$2.2T by the end of 2021, marking a ~5X increase

Global cost of cyber crime has risen rapidly with sophistication and scale

Trillions of dollars in damage (\$T)



Public and private sectors battle impacts from hacks, such as lawsuits and sanctions



\$20B

Estimated cost of global ransomware damages in 2021

In 2021 alone, there have been major cybersecurity breaches, leading to **hundreds of millions** of stolen data records. For example, a software-firm hack in February led to data compromises across 9 federal agencies and 18K companies

Prominent hacks this year led to the issuance of the **US Cyber Executive Order** in May, which established new rules for government suppliers for enhanced cybersecurity

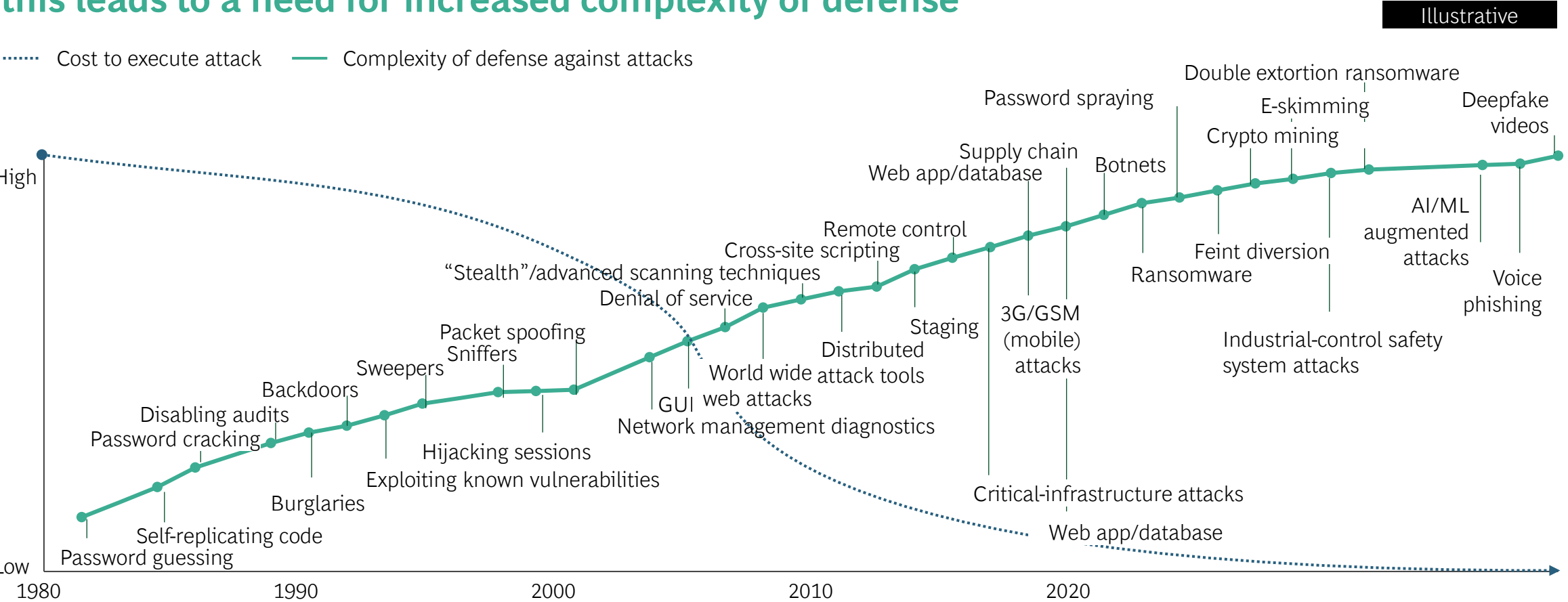
Private companies wrestle with the impacts as they are hit with **class-action lawsuits** from employees, customers, and partners after ransomware attacks (e.g., after pipeline hack, customers sue as supply dried up) and increasing **regulatory fines and sanctions**

Sources: Cybersecurity Ventures, World Economic Forum, press search, BCG analysis.

1.1
B

As cost to attack decreases, required complexity of defense increases

Cyber attacks are increasingly cheaper to execute as technology advances; this leads to a need for increased complexity of defense



1.2 As pandemic drives a massive increase in digital and devices, cyber attacks are rising even more as the attack surface expands

There has been a large increase in cyber attacks during the pandemic...



Spike in phishing attacks in the first quarter of 2020



Of IT teams saw a rise in cyber attacks in 2020



Increase in health care system hacks in the US in 2020

...as COVID-19 greatly accelerated digital transformations and drove reliance on IT

During COVID-19, there was an increase in digital adoption and devices online, thus increasing the **attack surface** and creating more opportunities for attackers. These changes are likely **longer-term trends**

Key drivers of digital adoption:



There was rapid growth in **digital platforms and cloud adoption**, such as online commerce and digital tools. While the technology is likely more secure, there may be gaps in processes/training, leading to vulnerabilities



Employees **working from home** were connecting remotely over unsecured networks, on personal devices, etc.



Disruption in existing business practices created **operational instability** and led to vulnerabilities

Sources: Forrester, Infosecurity Magazine, BCG *How Health Care Providers Can Thwart Cyber Attacks* (2021), Sophos, KnowBe4, BCG analysis and case experience.

1.3

77% of cyber attacks are due to human failures (e.g., people, processes) rather than technology

Only a quarter of cyber breaches are caused by technology issues...

Typical focus of attention (and important)

Often neglected (but at least equally important)

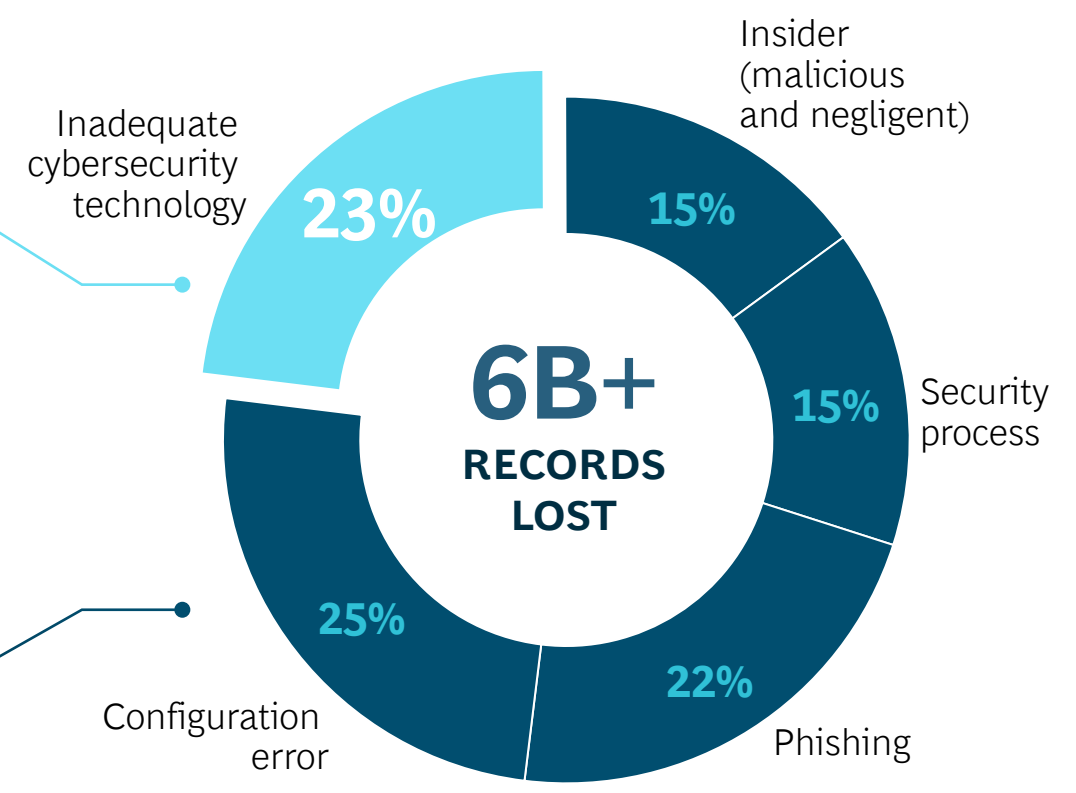


Inadequate technology causes 23% of breaches ...

... organizational, process, and people failures cause 77%

...whereas the remaining three-quarters are caused by human failures such as negligence or phishing

Reasons for cyber breaches



Sources: BCG analysis of 50 major data breaches (2021).

Cyber risks extend beyond direct financial impacts and can create existential company risk or human safety issues if not managed

Cybersecurity is a top priority for boards, CEOs, and C-suites across regions¹
Failing to manage cyber risk may lead to financial and other consequences

Direct financial risk

Cyber criminal used forged invoices to steal over **\$100M** from large tech companies

Other direct financial risks include **ransoms, class-action lawsuit payouts, and share price impacts**

For example, a financial services vendor lost **\$8B** in value after hackers stole data on **100M+** customers



Catastrophic risk

Enterprise software company put out of business as attacker **deletes all data and backups**



Operational risk

Bank data-theft attack **disrupted operations** for 2 weeks after wiping computers to hide fraud



Reputational risk

Telecom company lost over **100K customers and 1/3 of company value** after breach



Strategic risk

Stolen R&D data from drug manufacturer led to fast competition with **counterfeits**



Regulatory risk

Regulators punished transportation company with **\$148M fine for failing to report** data breach



Health and safety risk

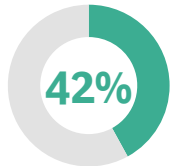
Hackers took control of furnace at steel mill, **preventing safe shut-down** and causing massive damages

As supply chains become more digital and complex, they are increasingly targeted for attacks

Attackers are increasingly exploiting supply chain vulnerabilities...



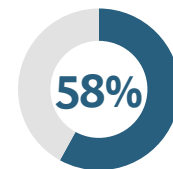
Of attacks happen through **supply chains** instead of directly targeting the company, as unprepared suppliers can be a **weak link**



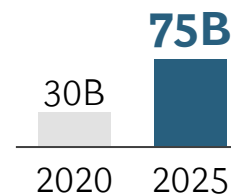
Increase in **supply chain cyber attacks** in the first quarter of 2021

In addition to direct attacks, attackers are increasingly engaging in a method called “**island hopping**,” in which they also aim to affect the victim’s **partners and customers**

...as there are more opportunities to attack in connected and complex supply chains



Of workloads will be hosted in **public and private clouds** by 2023. While cloud technology is safer, **improperly managed processes** can create risk



Connected **Internet of Things (IoT)** devices by 2025. Many newer devices **do not have enough** cyber protections built in or considered in design

Increased reliance on suppliers leads to reduced **transparency of risk**. There is also a need to secure an exponentially increasing number of **endpoints** as **connected devices** proliferate

Supply chains are one of the **most difficult** areas to secure because of the **lack of visibility and full control**. More companies and regulators are becoming aware of this growing gap and are continuing to look for viable solutions

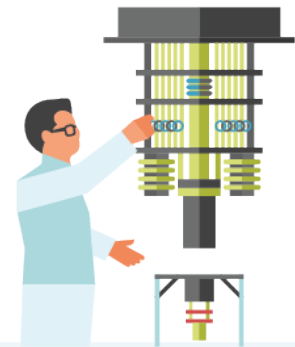
Quantum computing may become widespread in as little as 5-10 years, creating a need to overhaul encryption standards

Why it matters | Once commercially viable, quantum will render existing encryption standards obsolete. Even if action is not immediately required, leaders can think ahead

- 
- 1 Existing or classical computers use **bits** to store information
- 
- 2 Classical computers utilize encryption standards based on finding **prime factors** of large numbers hundreds of digits long

- 
- 3 Quantum computers use more powerful **qubits**, enabling exponentially greater computational **speed** (up to **100T times** faster¹)

Once algorithms are developed, they would be able to **hack** into today's secure systems

- 
- 4 Quantum computers, once thought to be science fiction, are now **on the horizon (5-10 years)**.² They may not fully replace classical computers but will be much better at certain jobs

- 
- 5 Currently, quantum computers do not have wide practical use cases. If **commercially viable**, however, they would **revolutionize** the world
- While there will be major advances, today's encryption standards would be **obsolete**, leading to a **new race** between attackers and the vulnerable

1. A team in China developed a quantum computer that performed a calculation in 200 seconds that would take a classical computer 2.5B years – an improvement of 100 trillion times.
2. Google is aiming to build a viable quantum computer by 2029. Sources: BCG *Ensuring Online Security in a Quantum Future* (2021), press search.

Cyber attacks continue to generate headlines as new technologies make it possible to create increasingly larger impacts

As of 26 August 2021



Biden calls cybersecurity “core national security challenge” in meeting with tech, education, and infrastructure leaders



T-Mobile says hackers stole data on more than 40 million people



Microsoft to acquire cybersecurity firm RiskIQ after breaches to Microsoft Exchange servers



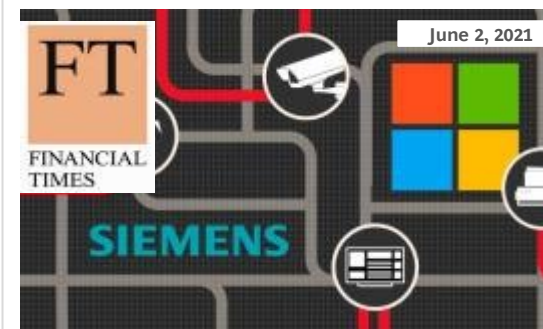
Up to 1,500 businesses could be affected by a cyberattack carried out against Kaseya



Belarusian hackers seek to overthrow national government



Hackers steal nearly \$100M, in Japan crypto heist targeting Liquid



Millions of connected devices have cybersecurity flaws, study shows



Ransomware highlights the challenges and subtleties of cybersecurity

It is critical for CEOs to set the cyber ambition and integrate cybersecurity into their business processes and broader strategy

4 actions for CEOs to build cyber capabilities

STEP 1

Determine need and ability to **set cyber ambition** for silver or gold levels – align with business strategy



Bronze

Cyber response

Reactive



Silver

Proactive



Gold

Anticipatory

STEP 2

Increase preparedness by understanding own maturity and focusing on **tangible wins**, then **scaling** cyber program across organization



STEP 3

In the event of a breach, avoid finger pointing; stay **aligned** across functions and ensure **transparency** internally and to third parties



STEP 4

Watch emerging/new technologies to **avoid blind spots** and prioritize preparation for cyber **future**



Step 1 | Orient cyber ambition relative to industry, peers, and investment ability

Most companies are at a bronze level of cyber capabilities today but should set ambitions to silver or gold as the dynamic threat landscape continues to evolve

AMBITION	PROTECTION SCOPE	TECHNICAL PROTECTION	RESPONSE
 Bronze % of IT spend¹ ~5%	Focus on crown jewels protection only; senior management commitment and basic employee trainings	Baseline technical protection (e.g., anti-virus software, defined policies/procedures)	Dispersed and reactive detection and response
 Silver ~10%	Risk-driven prioritization integrated into business processes ; senior management ownership and advanced employee trainings	Proactive technical protection (e.g., code scans, security testing, multifactor authentication)	Centralized incident detection and response (especially via Security Operations Center and threat intelligence feeds)
 Gold ~15%	Cyber risk management integrated across enterprise and corporate risk framework	Latest technical protection (e.g., AI-based and highly automated)	Anticipate and preempt incidents through automated cyber monitoring and pattern recognition

1. These levels are approximate. Investment requirements within ambition will vary significantly depending on industry, business complexity, region, and level of previous investment
Sources: BCG analysis and case experience.

Transformation

Most cyber transformations will take at least **3-4 years** to complete. Companies should prepare to invest **upfront 5-6x** their annual cyber spending

Industry context

Most sector leaders should **strive for silver** level ambition, but some sectors (e.g., finance, infrastructure, and telecommunications) require **gold level ambitions to be leaders**

Step 2 | Rethink prevention and detection of near-term attacks and build cyber into business strategy

Cyber attacks are inevitable, but preparedness can drive better outcomes
 4 areas for companies to take action to bolster cybersecurity programs:



PREVENT
 Identify critical “**crown jewels**” and prioritize securing assets **based on their value** (cannot protect all). Benchmark overall maturity and spending to competitors



DETECT
 Invest in **robust monitoring** capabilities; best-in-class organizations detect breaches in minutes vs. weeks by focusing on **malicious activity and indicators**



RESPOND
 Run tabletop exercises (TTX) to ensure that management and employees are **prepared for roles and responsibilities** in event of a breach



RECOVER
 Build a cybersecurity culture where the focus is not on blame, but on **continuous learning and improvement**

DESIGN CYBER INTO SYSTEMS
 Integrate cybersecurity strategy into the broader **business strategy including development of processes** (for traditional and remote working models). Do not wait to add cyber at the end

INCLUDE GOVERNANCE MODEL
 Ensure that cybersecurity is top of mind **across the company** by building it into **governance** for organization and supply chain. Focus on **simplicity and scalability**

Cyber as an enabler:

Strong cyber commitment not only prevents losses but can also be a **business enabler**

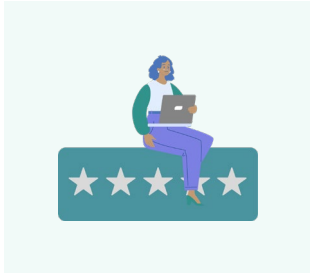
As consumers become increasingly concerned about the security of their information and the products they use, strong cybersecurity can be a **brand differentiator**—seen in industries like banking, insurance, and technology

Sources: Ponemon Institute, Osterman Research, BCG case experience.

Step 3 | If a breach occurs, top leaders must collaborate to notify key third parties, investigate, and communicate

10 steps for CEOs / CISOs / rest of C-suite to take following a breach:

NOTIFY CRITICAL THIRD PARTIES



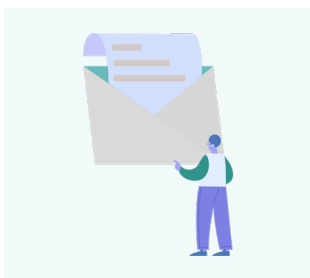
- Inform cyber **insurance** carrier if any
- Alert **banking and accounts payable** departments to scrutinize any large, anomalous transactions
- Depending on the situation, consider contacting **law enforcement**
- Ensure that regulatory-requirement actions for **personal identifiable information** (PII) are met in each region

INVESTIGATE INCIDENT



- Investigate incident at all levels and collect as much **information** as possible, such as from employees. This could be used in a legal defense or lawsuit
- Understand the **volume, type, and sensitivity** of the data exposed
- **Decide** whether to allow the incident to continue in order to collect more data or stop the incident by terminating access and working with data already collected

COMMUNICATE CLEARLY



- Identify and confirm organizational **narrative** and cadence of **communications**
- Communicate **internally and externally**, but do not make misleading statements. Be clear and direct with the information known at the time and state **action plan**
- Convey that individuals should **not discuss** incident publicly and should **refer all inquiries** to central communications team

Example—actions taken after a breach:

Large food company succumbed to **ransomware attack** impacting multiple plants

The company **suspended** all affected systems and contacted law enforcement, who worked with internal teams to resolve. **2 days** later, the systems came back online

The company then issued statements in consecutive days following the attack to **ensure transparency**. These actions helped **limit damage and panic**

Step 4 | Future-proof cyber by considering increased risk from emerging/new technologies and behavior changes

Important to understand risks from emerging technologies to evolve cybersecurity programs accordingly

1 IoT/Ecosystem

Breadth of entry points is continuing to increase

Cybersecurity needs to keep up with **growth of internal devices** as well as risks posed from **outside supplier systems**

4 Behavior changes

With hybrid work and potential changes to future talent models, it is critical to **invest in cyber education of employees and review business systems** to ensure a culture of cybersecurity, especially as people and processes make up a majority of breach entry points

2 AI and automation

As AI continues to evolve, leverage this technology as a cybersecurity tool while **preventing AI attacks** from cyber attackers

Rise of automation will require **new monitoring** capabilities

3 Future computing

Cybersecurity safeguards must be revisited as **new computing technology resets paradigm** (e.g., plan for eventual quantum shift by inventorying all encryptions and identifying actions required)



Example—Future-proofing:

Global retail group undergoing major digital transformation defined **cybersecurity strategy** to combat increased attacks

Approach: Conducted assessment, established risk map and crown jewels. Then developed plan with initiatives covering all key areas. Finally, derived longer-term future target state and model

Result: Discovered **50+** additional vulnerabilities and rationalized doubling the size of cybersecurity organization

Sources: BCG case experience.

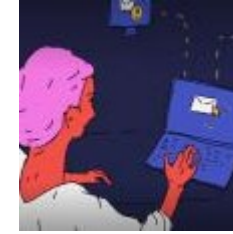
Additional perspectives on cybersecurity



[Managing the Cyber Risks of Remote Work](#)



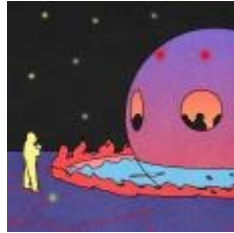
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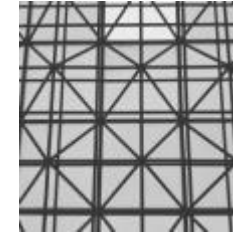
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