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The tip of the iceberg

Technology's impact on systemic risk in financial services

Introduction

Dear colleagues,

In recent years, we have seen an impressive acceleration of technology adoption in financial services. However, the pace of progress has been increasingly accompanied by concerns related to new, and sometimes hidden, systemic risks that must be understood and addressed to unlock the full benefit of digital innovation. To explain how technology can both increase and mitigate risk in the financial system, the World Economic Forum (the Forum) and Deloitte set out to explore the relationship between the adoption of technologies in financial services and systemic risk.

Our inquiry drew insights from the leaders of financial institutions, financial and non-financial technology players, regulators, policymakers, non-governmental organizations, and academic institutions. We conducted seven workshops, interviewed over 150 financial services and technology experts from prominent organizations, and carried out a survey with 50-plus respondents.

Our latest report, **Beneath the surface: Technology-driven systemic risks and the continued need for innovation**, details the results of that yearlong effort. In the pages that follow, we summarize the highlights of the full report, which aims to:

- Identify the potential short and long-term risks stemming from the increased use of technologies in financial services
- Deconstruct the identified risks and explore potential scenarios that can emerge as these technologies become more prevalent, and their implications on the financial system
- Explore plausible mitigation strategies and how innovation and the technologies themselves can help to mitigate risks

This study is the first in the Forum's two-part Technology, Innovation, and Systemic Risk initiative. It builds on previous work focused on the future of AI and emerging technologies in financial services. Whatever your role—regulator, policymaker, or industry executive—we welcome your thoughts on the accumulation of technology-led risks that lie beneath the placid surface of our financial services ecosystem.

Sincerely,

Bob Contri
Financial Services Industry Leader, Deloitte Global

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Key findings

The study has led to six key findings about the role that technology plays in creating, amplifying, and mitigating systemic risk in financial services.

Unregulated and partially-regulated financial players are contributing to a disproportionate share of systemic risk.

Big Tech companies, for example, can quickly turn into large financial gatekeepers without being subject to the full breadth of regulation. Decentralized finance models can seamlessly operate outside of regulatory structures, posing risks to financial stability, consumer protection and market integrity.

New interconnections are rarely bilateral.

Technology has changed how entity-to-entity relationships are established. As the number of digital links between service providers grows, actors will need to comprehensively understand their exposure to risk across the entire ecosystem.

Multilateral global alliances are essential to tackle financial crime and cybercrime.

Governments struggle with the bandwidth or legal consistency to share personal identifiable information across borders for crime prevention. Global players can overcome inconsistent national approaches by working together to resolve common issues.

An entity's systemic importance is currently determined based on the size of its book, which is becoming less relevant than its size of network.

The distinction is important because both size of book and size of network are indicators of an entity whose failure can cause instability in the financial system. Although, the former has strict capital requirements and supervisory scrutiny, its focus lacks direct attribution to non-financial players.

Investments in forward-looking risk prevention and detection are required to manage growing stochastic events.

The growing frequency of exogenous shocks (e.g., cyberattacks, climate change) is putting traditional risk models to the test. Without more effective data-sourcing techniques, the compounding effects of exogenous shocks could significantly compromise actors, nations, and the global financial system.

Addressing systemic risk must start with basics like a shared taxonomy and coherent frameworks.

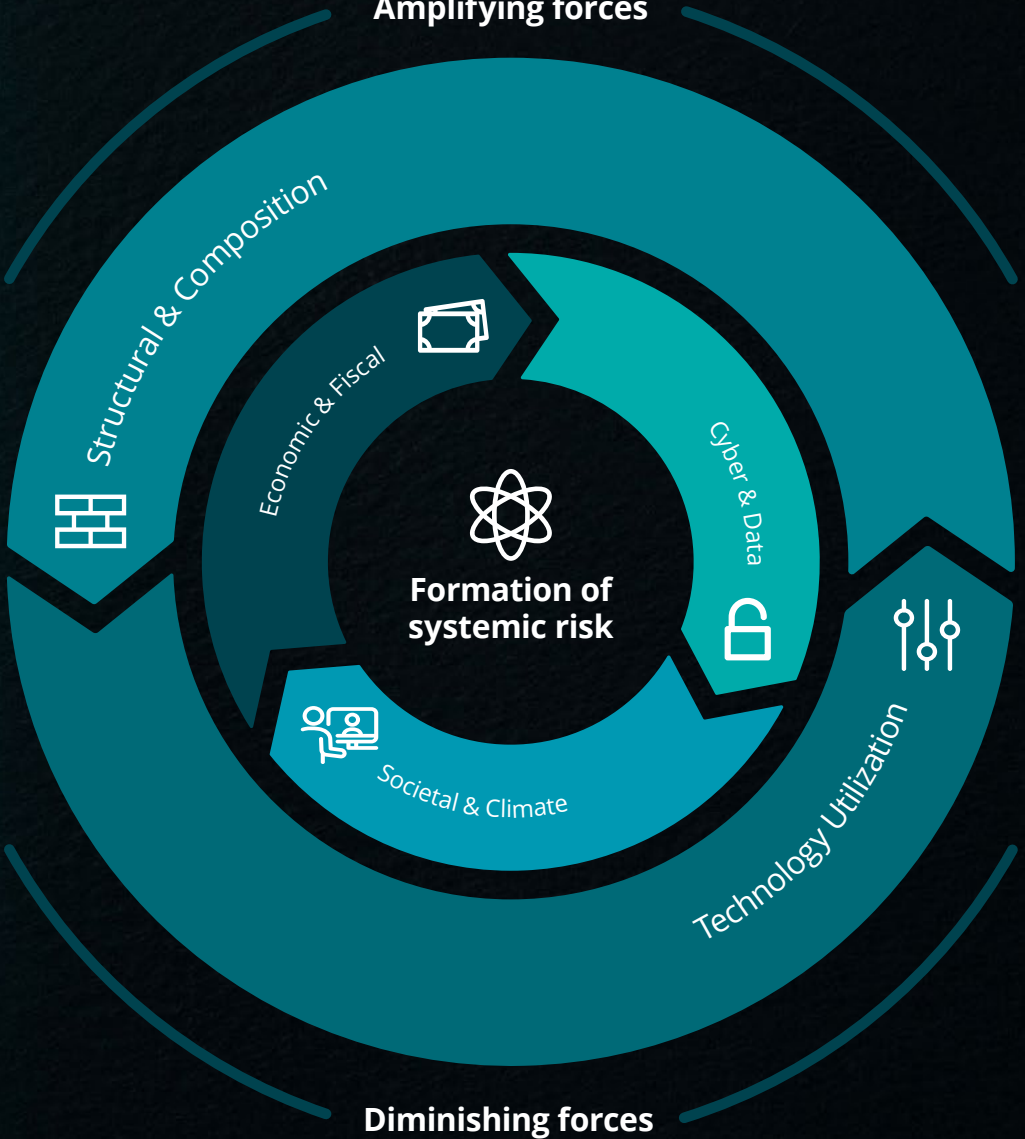
Fragmented efforts and siloed information make it hard to prevent systemic risk. They can also make it more challenging for non-risk focused executives to integrate, improve, and apply mitigation techniques. These root issues must be solved before technology can be deployed to successfully mitigate against systemic risk.

Sources of systemic risk

Accessibility Scale Competition

Size Independance Interconnection Acceleration

Amplifying forces



Diminishing forces

Oversight Transparency Ethics Diversification

Trust Coordination Governance

Sources of risk

Recent developments have led to fundamental shifts in the dynamics of the global financial system:

- *Accelerated digital transformation*
- *Increased value chain disruption*
- *Augmented regulatory pressure on financial activity*
- *Enhanced focus on environmental, social, and governance (ESG) priorities*
- *Democratization of data*
- *Increased malicious activity*

These trends are prompting the industry to rethink how it manages technology-driven systemic risk. Systemic risk isn't something that any single entity can resolve by itself. It's a compilation of seemingly isolated risks that grow and spread across interconnected and ingrained products, services, and systems over a defined period.

So where do these isolated risks come from?

Structural & composition

Some risks stem from the state of competitive dynamics in the financial services ecosystem. One example is too many institutions relying on too few outsourced technology vendors, creating concentration risks. Another is the regulators' challenge to keep up with innovation, resulting in a patchwork of requirements and fading boundaries between new players, business models, technologies, and traditional institutions.

Technology utilization

New technologies used in financial services can also create risks. Algorithms and deficient models can produce biased decisions or redundant feedback loops from the input data, the technology itself, or the people who operate the technology. AI models and algorithms can also return results that are inexplicable or lacking in context.

Economic & fiscal

Financial and macroeconomic conditions can put the safety and soundness of the global financial system at risk. Consider credit risk management constraints and the increasing displacement of funds that traditional financial institutions ordinarily hold. There's also the possibility of digitized trading and asset classes leading to market volatility and sell-offs.

Cyber & data

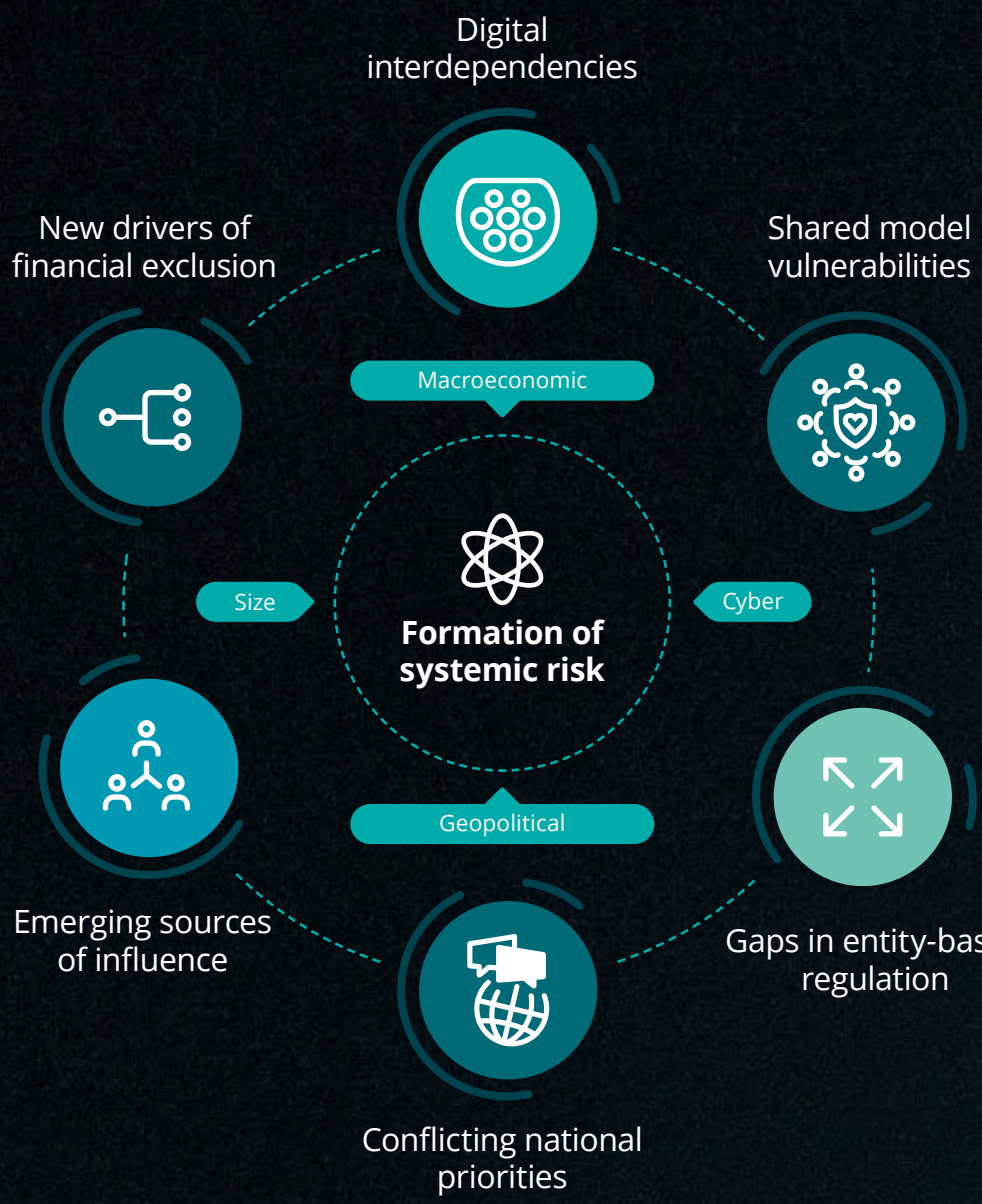
The use of data can be a source of risk, as can practices for either exploiting or safeguarding information technology. Malicious actors can take advantage of ineffective digital authorization or authentication controls, for instance. They can also exploit vulnerabilities associated with the rise of data portability and consumer connectivity.

Societal & climate

Finally, risk can arise from human interactions with one another and the natural world. The growing prevalence of misinformation, for example, can prompt wide-scale faulty decision-making among consumers, actors, and markets. And rising geopolitical tensions can launch a wave of cybersecurity events, financial crime, and intellectual property protectionism.

These sources—ones that create loss or drive uncertainty in financial services—can converge to create systemic risks. A look across the convergence of sources of risk reveals six recurring themes where technology is creating or amplifying systemic risk. We'll unpack those themes next.

Systemic risks from technology



Systemic risk theme 1:

Digital interdependencies

What is it?

Any entity that's highly interconnected can cause disruption with ripple effects throughout the economy. Well known examples are the 2008 failures of Bear Stearns and Lehman Brothers, the effects of which led to a global financial crisis. The failures also led to greater scrutiny of systemically important financial institutions.

Digitally interconnected players haven't received the same attention, despite the financial industry's growing dependence on technology providers. A financial institution might mitigate risk by outsourcing to a technology service provider, only to see its risk become pooled if the outsourcing company goes on to serve many other financial institutions simultaneously. Add third, fourth, and fifth-party provider relationships to the mix, and the risk increases even more. The more concentrated or complex connections in the digital system become, the greater the number of nodes that could be subject to, or cascade, cyber vulnerabilities and operational disruption.

What are the sources of risk?

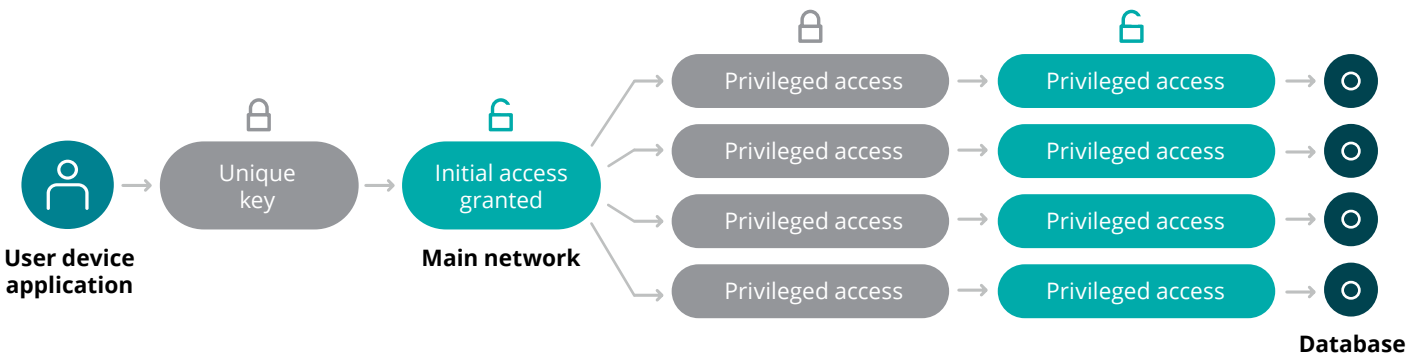
- *Growing ecosystem interconnectivity and modularity*
- *Consolidation of few vendors that offer critical capabilities*
- *Obscurity in increasingly complex supply chains*

How can technology help mitigate it?

Application	What it does	Use in financial services
Zero trust authentication	Continuously verifies users or applications trying to access an organization's network	Contains and rapidly identifies security breaches in a complex IT environment
Geographic information system	Applies mapping technology so that the IT group can understand where digital assets are located	Creates a clearer picture of network activity for global financial institutions to identify compromised operations and digital assets
Quantum key distribution	Uses quantum mechanics to share confidential information between two parties	Although not yet commercially available, can add layers of security to the bank-to-bank exchange of cryptographic keys

Spotlight on zero trust authentication

The Zero Trust methodology builds a segmented system and collection of mechanisms to provide organizations with the ability to enforce consistent security policies across the network. **How it works:**



Once provisioned access through the initial firewall, users must pass additional security measures (e.g., multi-factor authentication) to access each system, application, and/or database.

Systemic risk theme 2:

Shared model vulnerabilities

What is it?

Organizations increasingly rely on models to interpret liquidity, market, credit, and other risks. But traditional models that use historical or time series data can be inconsistent at predicting outcomes, especially for exogenous shocks. That can be true even with model risk management and model validation assurance in place. For example, many models that financial institutions depended on failed to properly account for the COVID-19 crisis due to built-in assumptions of a relatively stable future and limited acknowledgement of extreme potential outcomes.

What are the sources of risk?

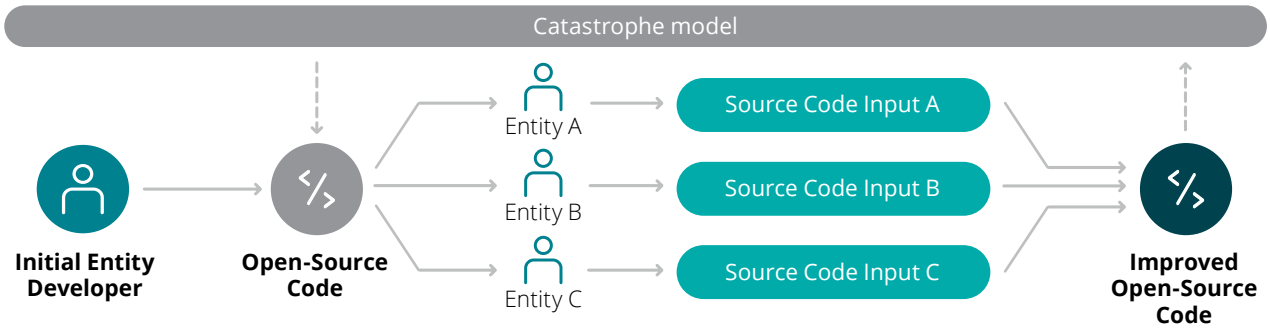
- *Algorithmic and model deficiencies*
- *Inexplicable machine and model-led outputs*
- *Credit risk management constraints*
- *Ineffective portability-related data protection*

How can technology help mitigate it?

Application	What it does	Use in financial services
Federated analysis	Allows financial institutions to analyze data and generate insights using data stored in different locations	Enables secure, collaborative intelligence across financial institutions for issues such as anti-money laundering
Open-source catastrophe modeling	Uses publicly available, alternative data sources to create a more comprehensive picture of risk	Allows insurers and re-insurers to account for events that lack historical data and accurate price premiums
Quantum-based Monte Carlo simulations	Runs multiple scenarios simultaneously, unrestricted by ordinary computational power	Allows credit and portfolio management risk functions to forecast the likelihood of evident and covert risks

Spotlight on open-source catastrophe modeling

Open-source catastrophe modeling encourages collaboration, transparency and consistency, allowing organizations to more confidently predict risk exposure. **How it works:**



Open-source frameworks allow for the input of third-party subject matter experts during the design of the model.

Systemic risk theme 3:

Gaps in entity-based regulation

What is it?

Non-bank financial offerings, decentralized finance, and digital assets are expanding in financial services, with lack of clarity around how the risks of these activities will be accounted for in existing regulatory functions.

This raises unique challenges for financial stability, safe transactions, and general consumer protection. Current regulation mostly focuses on entities, not activities, meaning an incumbent institution carrying out a specific financial activity is often subject to stricter regulation than a non-bank entity doing the same thing.

Trustless innovations without a designated intermediary are exacerbating the gap. For example, the lack of consumer protection and liability mechanisms led to the unaccounted loss of nearly $82 million in crypto scams from late 2020 to early 2021.[1]

What are the sources of risk?

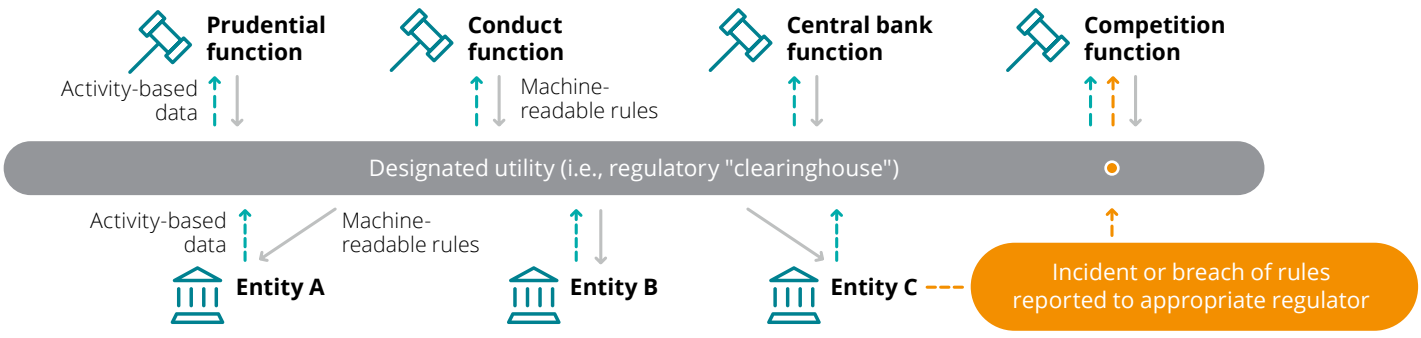
- *Undefined regulatory oversight for new entities and business models*
- *Stagnant and inconsistent customer data privacy controls*
- *Blurred jurisdictional boundaries*
- *Concentrated financial services market structure*

How can technology help mitigate it?

Application	What it does	Use in financial services
Regulatory recalibration	Integrates prudential (entity-based) and protection (activity-based) rules in a single regulatory approach	Allows different regulatory requirements only for the *specific* risks posed by different entity types
Digital regulatory reporting	Extracts and analyzes historic and current financial information like transaction volumes and credit risk	Equips regulators with complete, machine-readable information on all registered financial entities, while also reducing reporting burden
Centralized, rules-based regulatory clearinghouse	Digitally coordinates and matches regulation based on an entity's activities	Closes gaps in oversight among different regulatory functions and reduces compliance costs for institutions who would no longer need to report to multiple supervisory functions

Spotlight on centralized, rules-based regulatory clearinghouse

To solve for the inherent oversight gaps that exist in a functional regulatory environment, multiple regulatory functions can collaborate to build a designated utility that supports rules-based centralization. **How it works:**



The utility facilitates and coordinates the allocation of rules and reporting across all regulators and entities in a jurisdiction.

Systemic risk theme 4:

Conflicting national priorities

What is it?

Global issues such as cybercrime, coordinated financial crime, and fragmented cross-border data practices are causing increased harm to global financial systems. Nations could safeguard critical infrastructure, businesses and people more effectively if they worked together, but competing political and economic interests often get in the way. The result is a patchwork of rules around emerging risks along with a lack of consensus on international norms (such as promoting data privacy, preventing illicit finance or conducting cyber espionage for national security).

What are the sources of risk?

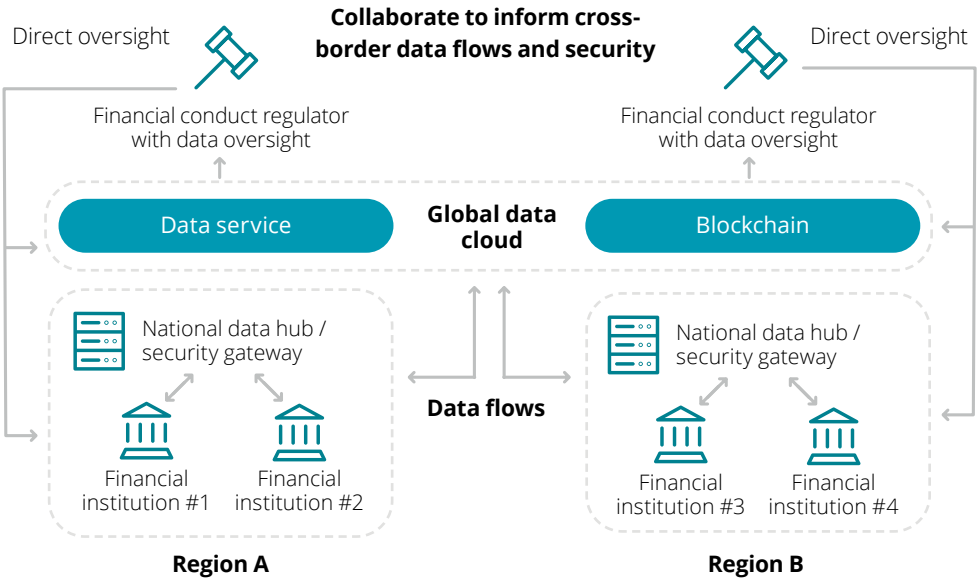
- *Rising geopolitical tensions*
- *Ineffective portability-related data protection*
- *Blurring jurisdictional boundaries*
- *Growing ecosystem interconnectivity and modularity*

How can technology help mitigate it?

Application	What it does	Use in financial services
Blockchain-enabled data authorities	Tokenizes data to enable transparent and efficient ownership, portability, and usage	Empowers financial supervisors to mandate free and safe data flow across borders
Decentralized transaction monitoring	Detects complex relationships and transactional patterns that indicate potential illicit activities	Improves regulator and bank collaboration and information sharing to combat global money laundering
Cyber threat hunting and attribution	Uses machine learning to identify attacks from specific criminal groups (e.g., based on historic behavior)	Detects and responds to cyberattacks faster and with more accurate attribution

Spotlight on blockchain-enabled data authorities

Global jurisdictions can look to instate a network of financial "data authorities", enabled by blockchain solutions, to facilitate the safe and sound cross-border transfer of data.
How it works:



The formation of a global data cloud can enable oversight on all inbound and outbound cross-border financial data flows and purpose-fit regulation.

Systemic risk theme 5:

Emerging sources of influence

What is it?

Low-cost digital platforms and brokerages have made it easier for retail consumers to participate in the capital markets. However, this improved access doesn't always have the guidance of licensed advisory. That's led to an uptick in people sharing stock trading, fundamentals, and other financial information online, most notably through social media channels.

All this has helped to democratize capital markets, but it's also made it easier for misinformation to spread unchecked. Malicious actors may even influence the public to create stock buying and selling frenzies. That can harm market participants, increase market volatility, and erode public trust in financial services.

What are the sources of risk?

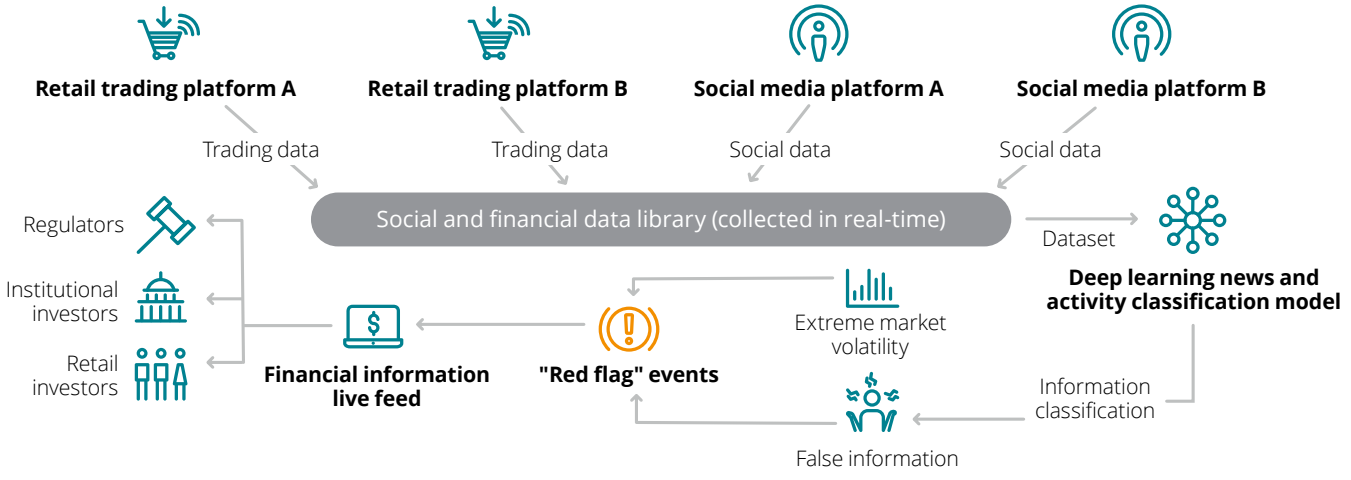
- *Dissemination of misleading or false information*
- *Undefined regulatory oversight for new entities and business models*
- *Growing social inequities and fragmentation*
- *New and emerging drivers of market movement*

How can technology help mitigate it?

Application	What it does	Use in financial services
Social listening	Uses machine learning and natural language processing to understand market sentiment on social media	Forecasts material changes in stock price and identify instances of manipulation
Mandated online learning	Offers on-demand, personalized financial education via a cloud-based platform that could be mandated by regulators to safeguard market participants	Empowers retail investors to navigate financial markets in a safer manner
Multilateral social information alerts	Flags false information in real-time via advanced models and deep learning techniques through Big Tech, incumbent and regulator collaboration	Reduces market volatility with improved trading surveillance and investment due diligence

Spotlight on multilateral social information alerts

By establishing a multilateral alert system, public and private sector players can collaborate to detect false information and diminish information asymmetry. **How it works:**



Deep learning techniques are well equipped to deal with complex interaction patterns between social networks and financial markets.

Systemic risk theme 6:

New drivers of financial exclusion

What is it?

Financial inclusion is an important tool for reducing poverty and facilitating economic development. It's not just a matter of public policy—incumbent institutions and fintech companies also have an interest in expanding access to financial services. For the industry, affordable products could open the door to billions of new customers worldwide.[2]

But affordability alone isn't enough to break down barriers to financial inclusion. The rise of online banking, for instance, has led to bank branch closures that disproportionately impact older, remote, and disabled populations. Gender gaps have also emerged, with women having less digital and financial access than men. Discriminatory biases in product decision-making remain a point of industry-wide scrutiny. There's also the rise in overlending, overspending, and unaffordable loans across both developed and emerging markets.

Another complication is that the rate of digitalization in emerging markets often outpaces digital and financial literacy among historically excluded customers. As a result, growing adoption is increasingly exploited by malicious actors who target victims through unmanaged, unsecure information assets like their mobile phones.

What are the sources of risk?

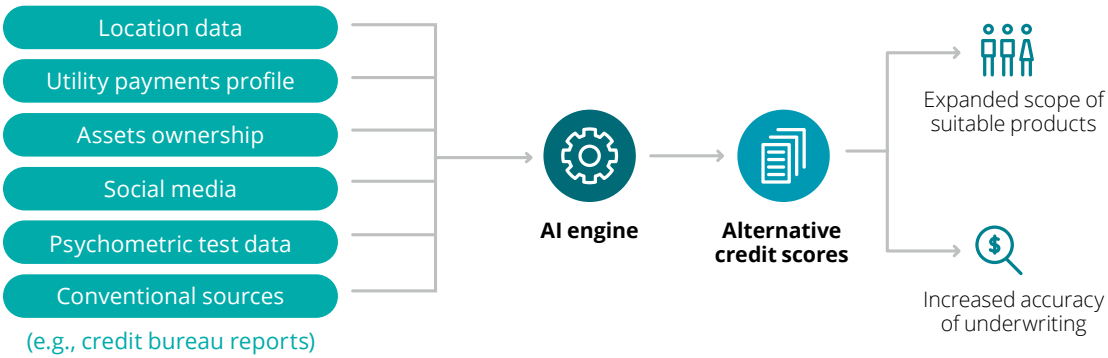
- *Social inequities and fragmentation*
- *Algorithmic and model deficiencies*
- *Inexplicable machine and model-led outputs*
- *Undefined regulatory oversight*

How can technology help mitigate it?

Application	What it does	Use in financial services
Alternative credit	Analyzes social media, electronic transactions, and cellular data to build consumer risk profiles	Makes better credit decisions for borrowers with a limited financial footprint
Explainable algorithms	Uses causal methods to account and compensate for social biases in decision-making algorithms	Predicts the rate of default on a loan and the price (or fee) of a product or service
Biometric authentication	Recognizes users by voice, fingerprint, face, iris, or retina, among other options	Allows financial services customers to prove who they are without official identification

Spotlight on alternative credit

Greater adoption of alternative credit scoring (ACS) mechanisms can improve the accuracy of product suitability assessments by providing an alternative to one-dimensional credit history. **How it works:**



ACS leverages unconventional consumer information with conventional credit sources.

Addressing risks in financial services

Systemic events are happening more often. This signals a pressing need for industry players to address seemingly isolated risks before they grow and spread across the ecosystem. Consider the following lessons from past mitigation efforts:

Systemic risk is hard to measure and difficult to prevent without equal access to information.
Data and analytical capabilities offer new ways to monitor and anticipate risk. Keeping regulatory functions informed in real-time can also kick-start resiliency plans and recourse measures to dampen the impact of a potential crisis.

Players should remain conscious of the trade-off when creating new relationships.
When leaders deploy new technologies through shared capabilities or vendors, they must remain conscious of their external relationships. Although new technologies can help monitor sprawling vendor networks as a form of risk mitigation, they add to ecosystem dependencies that can create another source of operational risk.

Framework-driven alliances need to be sought for multilateralism.
Although support from global policy bodies can make it easier for players to reach agreements, the absence of formal legal frameworks dedicated to a shared burden makes it increasingly difficult to solve for systemic risks. The private sector needs to proactively engage the public sector to create new, objective-driven frameworks (e.g., joint AML, responsible AI) that pave way for collective solutions (e.g., sharing personal identifiable information).

As industry lines blur, so can regulatory functions.
Not all players who are critical to the functioning of financial services are under the purview of financial services supervision and regulation. Regulators need to keep tabs on emerging activities to maintain a consistent taxonomy and adequate regulatory coverage. Recalibrating and unpacking the mix of entity-based and activity-based oversight may be effective in expanding regulatory perimeters to cover new business models.

Understanding business model nuances will be a critical first step. For example, the financial objectives of big technology firms are not always based on interest income like those of incumbents; rather, they are often based on data and flow-of-business.

Sources of systemic risk are driven by context.
There's no one-size-fits-all approach to address the varying contexts that drive sources of risk. For example, societal issues such as digital or financial exclusion and literacy can be recognized and addressed as separate but connected issues. The nomenclature and understanding of these issues should be standardized across jurisdictions, but their approaches will remain tailored.

Concluding thoughts

Systemic risk can be unpredictable and hard to understand, with mitigation techniques that tend to solely rely on lessons from the past. But there's another way to tackle it, which is to look at systemic risk scenarios and break them down by their sources of risk. Additionally, a new risk agenda is encouraged, where public and private sector actors look to understand global technology-driven systemic risks. In that spirit, here are some key steps for financial services actors to consider:

Pursue collective action

The blurring of traditional industry lines and regulatory discrepancies between nation states means that action at the entity level will not be enough to tackle complex issues. Regulatory functions and industry players will need to foster a common understanding of risk—one that isn't always predicated on past events—and collectively scenario plan the events traditionally deemed 'unlikely'. Collective investment decisions to mitigate risk need to reflect these multilateral exercises.

Collectively redefine systemic importance

Regulatory actors will also need to work across functions to augment existing rules to better account for non-financial players that are critical to the functioning of financial services. Concerns around concentration risk can be addressed by creating an industry-agnostic designation for systemically significant players. For example, standing up a dedicated regulatory body that accounts for data-driven business lines.

Enhance internal capabilities

Both private and public sector actors might look to source new risk-based data from outside the organization. With that, they can take advantage of new, data-intensive capabilities like privacy enhancing technologies and AI, applying them to a well-defined set of priority risks. By accessing new data and digital capabilities, players can strengthen risk mitigation processes and transform risk centers into a source of competitive differentiation from a traditionally costly business imperative.

Enlist the right people

Risk management functions can become more strategic to support enterprise goals. That takes leaders who have bold perspectives on the future at the intersection of technology and risk, plus the ambition to translate this vision into reality.

We welcome your questions and ideas and invite you to reach out to any of us by email. For more on this subject, please read the Forum report this summary is based on, **Beneath the surface: Technology-driven systemic risks and the continued need for innovation**. Meanwhile, stay tuned for results from part two of the Technology, Innovation, and Systemic Risk initiative.

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More from the World Economic Forum and Deloitte

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Disruptive innovation in financial services: A blueprint for digital identity (2016)

The future of financial infrastructure: An ambitious look at how blockchain can reshape financial services (2016)

The future of financial services (2015)

Endnotes

1. Alexander Osipovich, "Crypto Frauds Target Investors Hoping to Cash In on Bitcoin Boom," Wall Street Journal, 7 June 2021, https://www.wsj.com/articles/crypto-frauds-target-investors-hoping-to-cash-in-on-bitcoin-boom-11623058380

2. "The Global Findex Database 2017: The Unbanked," Global Findex, The World Bank Group, 2017, https://globalfindex.worldbank.org/chapters/unbanked

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