

**CHARACTERISTICS OF NEW RISKS ASSOCIATED WITH EVOLVING
TECHNOLOGIES FOR DIGITAL FINANCE BASED ON BIG DATA**

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Annotation: This article argues that big data-driven digital finance expands the boundaries of transactions by serving large populations that are not covered by traditional financial systems, have long tail characteristics, and therefore have specific risk profiles.

Keywords: Big data, information architecture, volumetric storage, new discoveries, business challenges, risk profiles.

Big data-driven digital finance expands transactional boundaries, serving vast populations underserved by traditional finance (exhibiting "long-tail" characteristics) and thus presenting distinct risk profiles. These users typically possess limited financial literacy, risk recognition, and risk-bearing capacity, constituting vulnerable groups within the financial sphere susceptible to misrepresentation, fraud, and unfair treatment. Their investments are typically small and fragmented. For individuals, the cost of monitoring big data-driven digital financial institutions far exceeds the potential benefits, making the free-rider problem more pronounced. Consequently, market discipline within big data-driven digital finance is more susceptible to failure. Both individual and collective irrationality become more prevalent. Should risks materialise in big data-driven digital finance, the negative externalities to society are substantial when measured by the number of individuals affected (even if the monetary amounts involved may be modest).

Risks at the product design level.

Technical Vulnerabilities. Big data-driven digital finance is a relatively new development, with many information technologies still immature and prone to technical vulnerabilities. This may trigger numerous information technology risks, primarily including data security risks, cybersecurity risks, and business continuity risks [1].

Data security risks. Data security risks refer to threats posed to electronic data, including theft, leakage, tampering, or loss. Common threats encompass: information disclosure, compromise of data integrity, denial-of-service attacks, unauthorised access, eavesdropping, impersonation, bypassing controls, unauthorised access, Trojan horses, backdoors, repudiation, replay attacks, computer viruses, human error, physical intrusion, theft, and business fraud. In practice, data within big data-driven digital financial institutions comprises both structured and unstructured information, stored across production systems and backup centres. Users access websites and transmit data via traditional authentication methods such as usernames, passwords, and SMS verification codes. This data primarily encompasses critical personal information including usernames, login credentials, bank account details, and national identification numbers. Numerous instances of customer data loss have already occurred. Certain big data-driven digital financial institutions have failed to establish comprehensive, long-term mechanisms for personal privacy protection throughout data transmission, storage, utili-

sation, and destruction. This significantly elevates the risk of information leaks [2]. Data security risks primarily stem from two sources: Firstly, malicious attacks by external hackers result in data tampering and loss. Technical vulnerabilities attract numerous hackers to scrutinise big data-driven digital financial institutions. Hackers engage in efficient information sharing and coordinated operations, steadily enhancing their overall attack capabilities and devising ever-evolving tactics.

Secondly, data corruption may result from internal personnel errors, malicious sabotage, or system/equipment failures. Consequently, urgent improvements are required in personnel management, equipment and technology, and regulatory frameworks to safeguard the data security of big data-driven digital financial institutions [3].

Cybersecurity Risks. Cybersecurity risks refer to dangers arising from cyberattacks, penetration, eavesdropping, computer viruses, and other threats targeting big data-driven digital financial institutions within the internet environment. These risks primarily fall into three categories:

First, network communication security risks. Within the internet environment, user logins, enquiries, and transactions are conducted via networks. Some big data-based digital financial institutions lack security mechanisms to protect sensitive information, such as confidentiality protocols safeguarding user identity and transaction details during transmission, or employ weak cryptographic algorithms that are easily compromised. Should sensitive client information—including funds, account details, and passwords—be compromised or tampered with during transmission, this poses a grave threat to the financial security of big data-driven digital finance customers.

Secondly, website security risks. Online trading platforms provide services such as online payments, investments, and lending, meaning the reliability of these websites directly impacts users' financial security. In recent years, alongside advancements in internet technology and the development of big data-driven digital financial products, the web application security challenges faced by big data-based digital financial institutions have grown increasingly complex. Security threats are proliferating rapidly—including hacker attacks, worm viruses, DDoS attacks, SQL injection, and XSS attacks—causing significant distress to users and inflicting severe damage upon corporate information networks and core business operations [4].

Thirdly, client-side security risks. Numerous financial security incidents originate from vulnerabilities in client-side systems. Due to the fragility of terminal operating systems and insufficient user security awareness, big data-based digital financial clients are highly susceptible to malicious code, phishing, and other hacking techniques. Most client applications are developed using common browsers, creating risks of client information being compromised through browser vulnerabilities. Even when security controls are implemented, they may prove inadequate against common attacks due to insufficient robustness. The "White Paper on the Current State of Information Security in Internet Finance Apps" published by the China Academy of Information and Communications Technology reveals that the majority of digital finance applications suffer from issues such as misused encryption algorithms and incorrect or incomplete implementation of encryption protocols. Furthermore, when utilising untrusted public Wi-Fi networks, there exists the potential for malicious hackers to engage in network eavesdropping and manipulation.

Business Continuity Risk. Business continuity risk refers to the peril arising from unexpected interruptions in the operation of information systems within big data-driven digital financial institutions, leading to a severe decline in service levels. Such disrupt-

tions can trigger investor panic, damage institutional reputation, or even precipitate bankruptcy. The Alipay outage in July 2016 exemplifies this risk: a failure at Alipay's South China data centre rendered payment and transfer services inaccessible to users. The emergence of business continuity risk not only damages the reputation of big data-based digital financial institutions but also enables criminal elements to exploit system failures to defraud customers, thereby compromising both fund security and information security.

Applicability Issues. Numerous big data-driven digital financial institutions are developing proprietary application devices, yet the absence of unified standards readily triggers compatibility issues. As big data-based digital finance remains in its nascent stage, these institutions have not comprehensively tested for compatibility. For instance, certain financial software may only function within specific systems, where poor compatibility can cause crashes, lag, or complete inoperability of settings. Such incompatibilities cause significant inconvenience and potential losses for consumers, undermining the long-term viability of internet finance. Seamless integration between software and hardware is essential, alongside the seamless fusion of technology and finance; failure to achieve this creates substantial conflicts.

Operational Risks at the Institutional Level.

Marketing Risks. The advancement of internet technology exerts a dual influence on big data-driven digital financial institutions. On one hand, technology delivers considerable convenience, enhancing corporate appeal to customers and increasing customer accessibility. For instance, big data improves marketing precision and elevates product promotion efficiency. Conversely, consumers require time to adopt new technologies, and immature systems heighten marketing complexity. While big data-driven digital finance lowers capital thresholds for investors, it raises technical barriers. Some consumers may abandon investments due to the complexity of new products. Professor Philip Kotler notes in *Marketing Management* that the failure rate for new service product development—including financial innovations—stands at 18%. Poor user experience stemming from design flaws in digital financial products can also trigger customer attrition. Furthermore, numerous big data-driven digital financial institutions have faced negative publicity, such as data breaches and fund theft, causing consumers to question their security. Consequently, many consumers continue to opt for traditional financial products rather than readily experimenting with new offerings.

Internal Management Risks. Internal management risks within big data-driven digital financial institutions primarily manifest in areas such as suboptimal product design, inadequate staff training, and insufficient internal controls. Firstly, operational errors within these institutions warrant careful consideration. As big data-driven digital finance emerged relatively late, lacking sufficient time for trial and error, certain product designs inevitably contain flaws. These design defects heighten the likelihood of operational missteps. Secondly, despite the rapid expansion of big data-driven digital finance, training for relevant practitioners has failed to keep pace. Many professionals lack sufficient understanding of these products, leading to communication difficulties with customers and frequent instances of consumer misdirection.

Funding and Talent Shortages. The research, development, and application of such technologies demand substantial financial investment and skilled personnel. Many small and medium-sized enterprises cannot afford such significant expenditure, whereas large corporations hold a distinct advantage in this regard. Furthermore, the uneven distribution of capital and talent also impacts the operations of big data-driven digital financial

institutions. Taking China as an example, professionals in the big data-driven digital finance sector must possess both financial expertise and substantial technical experience. However, such multidisciplinary talent is scarce and concentrated in Beijing, Shanghai, Guangzhou, Shenzhen, and other developed coastal regions. Similarly, capital distribution exhibits this imbalance. Consequently, developed regions will enjoy greater development opportunities, while small and medium-sized big data-driven digital financial institutions in less developed areas face increased pressure.

Macro-level risks.

Talent Reallocation. The rapid advancement of big data-driven digital finance may induce structural shifts in labour market demands, potentially causing short-term structural unemployment. Internet technologies have elevated automation levels, rendering many financial processes no longer reliant on human intervention. Indeed, instances of technology replacing human labour abound: ATMs, online banking, and mobile banking are supplanting bank tellers, while robo-advisors are taking over the role of financial advisers. Although the adoption of these technologies significantly reduces costs for financial institutions and boosts labour productivity, it consequently diminishes societal demand for labour. Positions requiring lower technical expertise within financial services will particularly diminish, compelling many individuals to face the pressure of career re-planning [5].

Systemic Financial Risk. If big data technology is not applied judiciously within the financial sector, it may precipitate systemic financial risks. Take robo-advisors as an example: should the investment advice they generate prove unsuitable, it could trigger widespread irrational investment behaviour. Numerous investors might channel funds into projects with poor profitability, while genuinely high-quality ventures fail to secure necessary capital. Moreover, investment recommendations derived from algorithmic formulas in robo-advisors often converge.

Given the broad reach of such advisory services, this convergence fosters substantial herd behaviour. Simultaneous, directional capital flows exert immense pressure on financial institutions, triggering liquidity risks. Such uniform investment behaviour also amplifies the procyclicality of asset prices, inflating asset bubbles during upturns and accelerating declines during downturns.

Consequently, immature digital financial products based on big data may not only fail to generate wealth but could inflict substantial losses on investors, heighten the contagion of risk, disrupt the normal functioning of the economy, and disturb social order.

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