

FinTech and Artificial Intelligence in Financial Services: Comparative Regulatory Challenges

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Abstract

The rapid development of financial technologies and artificial intelligence is transforming the structure, operation, and regulation of contemporary financial services. FinTech applications, including digital payments, crowdfunding platforms, robo-advisory services, blockchain-based systems, RegTech, and SupTech, contribute to greater efficiency, accessibility, and financial inclusion. At the same time, their growing use generates significant legal and institutional risks related to consumer protection, data security, algorithmic discrimination, cybersecurity, market stability, regulatory fragmentation, and the cross-border provision of financial services. This article examines the evolution of FinTech and the increasing integration of artificial intelligence into the financial sector from a comparative legal perspective. The research is based on the analysis of relevant academic literature, European Union legislation, international regulatory approaches, and selected national practices, with particular attention to the regulatory framework applicable in the European Union and to developments in Hungary. The study also considers the implications of Regulation (EU) 2024/1689 on artificial intelligence for financial institutions, especially in relation to high-risk AI systems used for creditworthiness assessment, risk management, compliance, and supervisory activities. The analysis demonstrates that the principal regulatory challenge is to reconcile technological innovation with consumer protection, financial stability, transparency, accountability, and effective supervision. Excessively restrictive regulation may hinder innovation and market access, whereas insufficient oversight may expose consumers and financial systems to fraud, discrimination, operational failures, and systemic risks. The article therefore argues in favour of proportional and risk-based regulation, strengthened international cooperation, regulatory sandboxes, and closer integration between financial supervision and artificial intelligence governance. It concludes that coherent national and international regulatory frameworks are necessary to ensure that FinTech innovation develops in a secure, ethical, and legally accountable manner.

Keywords: FinTech, artificial intelligence, legislation, application of law.

JEL Classification: K22, K23, K24

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1. Introductory Remarks

The rapid advancement of modern technologies is evident across almost all areas of the economy and society, and the financial sector is no exception. The development of artificial intelligence has reached several significant milestones over the past decades. Although the formal beginning of AI research is generally associated with the 1956 „Artificial Intelligence” conference held at Dartmouth College, and early achievements - such as the ELIZA system, often regarded as one of the first chatbots – appeared as early as the 1960s, the technology gained truly widespread recognition only much later. A major turning point occurred at the end of 2022 with the public release of ChatGPT, which significantly increased interest in artificial intelligence and accelerated its broader adoption.²

The development of financial technology did not happen through a single breakthrough. Instead, it developed gradually over time through several stages. Each stage responded to new technological and social challenges and changed how financial systems work and how people access financial services. Researchers usually divide the evolution of FinTech into four phases: FinTech 1.0, 2.0, 3.0, and 3.5. The origins of FinTech go back to 1866, when the first transatlantic telegraph cable was installed. This innovation made it possible to send financial information quickly between continents. Later, telex machines and teleprinters further improved international financial communication. In 1950, the first widely used credit card appeared, offering an alternative to cash payments. The second phase began with the introduction of the automated teller machine (ATM) in 1967. ATMs helped banks serve customers more efficiently and reduce operating costs. In 1973, the SWIFT system was created to standardize and secure international bank communication. In the 1980s, algorithmic trading started to develop, and mobile phones opened new ways to access financial services. In the early 2000s, the rapid spread of the internet and the emergence of crowdfunding further accelerated the growth of FinTech.³ The third phase of FinTech development began after the global financial crisis of 2008. During this time, traditional financial institutions focused on managing the crisis, which created opportunities for smaller and more innovative FinTech startups. One important milestone was the launch of Bitcoin in 2009. It challenged traditional ideas about money and introduced decentralized transactions without central intermediaries. At the same time, smartphones spread rapidly, making financial services accessible anytime and anywhere. As a result, mobile payments, digital wallets, and Decentralized Finance (DeFi) became important parts of the global financial system. The FinTech 3.5 phase developed alongside FinTech 3.0 but mainly reflects the situation in developing regions such as South Asia and Africa. In many of these countries, financial literacy is low, banking infrastructure is limited, and cash is still widely used. Many people also distrust

² Anna Domokos and Péter Sajtos, “Mesterséges intelligencia a pénzügyi szektorban – Innováció és kockázatok [Artificial Intelligence in the Financial Sector—Innovation and Risks],” *Hitelintézet Szemle* 23, no. 1 (2024): 155.

³ Péter Bagó, “Mesterséges intelligencia a pénzügyekben [Artificial Intelligence in Finance],” *Gazdaság és Pénzügy* 10, no. 1 (2023): 21–22, <https://doi.org/10.33926/GP.2023.1.2>.

traditional banks because of corruption or poor services. Therefore, there is a growing demand for non-bank FinTech solutions, which can help improve financial inclusion and support economic development.⁴

2. Opportunities and Risks of FinTech Applications

Mobile payment systems primarily make financial transactions faster and more convenient for customers. At the same time, cloud-based technologies support financial institutions by modernizing data storage and enabling more efficient use of computing capacity, thereby improving operational efficiency. Overall, recent technological developments have mainly focused on specific segments of the financial services value chain. Most innovations can be distinguished based on whether they primarily enhance customer experience or significantly affect internal operational processes. AI, however, has the potential to support the entire financial services ecosystem.⁵ One of the distinctive features of AI is that it simultaneously offers cost-reduction opportunities and competitive differentiation, making it an attractive solution for organizations. However, with the exception of fraud detection, the benefits of AI largely depend on the size and resources of the organization implementing it. The use of AI may also introduce several risks. Including those related to non-representative datasets, biases present in data, the functioning of selected algorithms, and the way in which humans interpret AI-generated decisions – or whether humans remain involved in decision-making processes at all. In order to mitigate these risks, it is essential to establish a clear and responsible division of tasks between artificial intelligence systems and human employees.⁶ Proper use of AI can greatly improve cybersecurity, for example by detecting fraud more effectively and using automated defences, which directly helps customers. AI can also help financial institutions follow regulations and report to authorities automatically. Banks and financial companies are not just service providers; they are complex organizations with many functions. AI can assist in areas like human resources, brand design, planning branch locations, or organizing customer service centres. This shows that AI has many uses. Financial institutions can use it not only for predicting and analysing data but also for creating new value with generative AI.⁷

A major trend in FinTech is the rise of cashless payments. More companies are creating digital payment solutions to make transactions faster and easier for customers. For example, Starbucks has its own mobile app for digital payments. As digital payments grow, future research will focus on fast data transfer, security, user experience, and advanced data analysis. Important features of payment systems are convenience, speed, traceability, and safety. Blockchain is an important part of payment technology. Examples include smart contract platforms like Hawk and blockchain tools

⁴ Bagó, “Mesterséges intelligencia a pénzügyekben,” 22–23.

⁵ Domokos and Sajtos, “Mesterséges intelligencia a pénzügyi szektorban,” 158.

⁶ Željko Jović and Ivan Nikolić, “The Darker Side of Fintech: The Emergence of New Risks,” *Zagreb International Review of Economics & Business* 25, special conference issue (2022): 45–63, 59, <https://doi.org/10.2478/zireb-2022-0024>.

⁷ Domokos and Sajtos, “Mesterséges intelligencia a pénzügyi szektorban,” 158.

for protecting personal data. Digital currencies, such as Bitcoin, are also gaining attention. There is debate about their benefits and drawbacks, including whether Bitcoin could become an official currency and what affects users' decisions to adopt it. For businesses, FinTech payments aim to make operations more efficient, increase sales, automate customer service, and keep customers loyal. Payment innovations should not just focus on consumers (B2C) but also on business-to-business (B2B) transactions.⁸ The market potential of FinTech is clear from PayPal. It has over 100 million active users worldwide and handles hundreds of millions of dollars in payments every day. Demand for prepaid cards is also growing. In the EU, almost all bank account holders have a debit card, and about 40% have a credit card. Online shopping is becoming more common—around 34% of EU citizens shop online, and over half use smartphones for mobile payments. Some industries, like travel, now sell most of their services online. Small and medium-sized businesses (SMEs) are especially open to FinTech solutions, as they offer real practical benefits. This makes sense, since SMEs make up the backbone of many economies, representing about 80% of global economic activity.⁹ FinTech is becoming more common in advisory services. These services give users recommendations based on rules and guidelines. They include investment advice, wealth management, insurance services, customer support, and help with business decisions. FinTech brings disruptive innovations to this area, changing the market. Many traditional investment and insurance companies worry that FinTech could transform their operations. Using smartphones, advanced sensors, AI, machine learning, algorithms, and automation can make advisory services faster, more efficient, and personalized, while also reducing costs and improving user experience. One growing area is robo-advisors, especially in investments. These systems give automated financial advice and manage wealth using AI and machine learning. Robo-advisors provide personalized investment recommendations that are updated in real time with data like oil prices or stock indexes. Similar approaches are used in insurance apps, which collect health data from wearable devices to create customized insurance plans.¹⁰

Financing refers to activities aimed at obtaining financial resources for businesses, traditionally carried out through various channels such as family loans, bank credit, retained earnings, venture capital, franchise systems, government subsidies, equity issuance, bonds, and other financial instruments. However, the development of FinTech has also introduced new alternative financing methods that operate outside traditional systems. One prominent example is crowdfunding, which enables businesses to access funding at lower costs or through channels that were previously unavailable. Crowdfunding has become one of the most popular forms of alternative financing, particularly for startups seeking to bridge the funding gap between the early

⁸ Kelvin Leong and Anna Sung, "FinTech (Financial Technology): What Is It and How to Use Technologies to Create Business Value in Fintech Way?," *International Journal of Innovation, Management and Technology* 9, no. 2 (2018): 75, <https://doi.org/10.18178/ijimt.2018.9.2.791>.

⁹ Sofia Anyfantaki, "The Evolution of Financial Technology (FinTech)," *Economic Bulletin*, no. 44 (2016): 47-62, 50.

¹⁰ Leong and Sung, "FinTech (Financial Technology)," 76.

development phase and later stages of capital investment.¹¹ Crowdfunding establishes a direct connection between investors and entrepreneurs while reducing the role of traditional financial intermediaries such as banks or investment firms. As a result, it may contribute to lower funding costs and broader access to financial resources, thereby promoting the democratization of financial services. However, some scholars argue that these platforms merely represent a new form of intermediation, a phenomenon referred to as “reintermediation.”¹² Crowdfunding also presents several risks for investors, including fraud, low liquidity, and the absence of traditional investor protection mechanisms. This may justify the introduction of certain regulatory frameworks aimed at protecting investors, even if these platforms are not subject to the strict licensing and operational rules applied to investment firms. At the same time, excessive regulation could limit innovation and economic opportunities in this field.¹³

Technology has also brought new ways to handle regulatory compliance. Compliance means following rules, standards, and laws, which is an important part of running a modern business. RegTech (Regulatory Technology) is a new area that uses technology to help companies meet these requirements. While compliance helps reduce risks, build trust, and can lower costs (like getting cheaper loans), it often doesn’t create direct business value. Future research should look at ways to make compliance faster, cheaper, and more effective, and use technology to automate tasks that used to need a lot of human work..¹⁴ According to the Financial Stability Board (FSB), RegTech means using FinTech tools by regulated financial companies to follow rules, meet compliance, and report properly. It can also mean the companies that make these tools. RegTech is a part of FinTech focused on making regulatory compliance faster and easier. While FinTech covers all technology in finance, RegTech is about using technology for rules, reporting, and supervision. It is closely related to SupTech, which is FinTech used by regulators themselves. Using RegTech and SupTech more widely can reduce risks. For example, machine learning tools can help monitor market abuse, and some regulators—like the European Central Bank and the Federal Reserve—use AI techniques like natural language processing to spot financial risks.¹⁵

3. Legal Matters

The purpose of technology has always been to make life and operations easier for users, individuals, businesses, or government institutions. The technological development of the banking sector and the emergence of FinTech solutions have brought significant benefits to the economy. However, there are still gaps and vulnerabilities in the system that can lead to financial abuse. This creates a need for

¹¹ Ibid.

¹² Eugenia Macchiavello, “The Licensing Principle and Investment-Based Crowdfunding,” in *Fintech Regulation and the Licensing Principle*, ed. Dário Moura Vicente, Diogo Pereira Duarte, and Catarina Granadeiro (Frankfurt am Main: European Banking Institute, 2023), 46-70, 47.

¹³ Macchiavello, “Licensing Principle and Investment-Based Crowdfunding,” 50-51.

¹⁴ Leong and Sung, “FinTech (Financial Technology),” 77.

¹⁵ Jović and Nikolić, “The Darker Side of Fintech,” 53.

stricter financial regulations. Although people generally trust FinTech companies, many of these firms are not yet under sufficient regulatory oversight.¹⁶ It is crucial, however, that necessary regulatory changes do not stifle innovation while still providing the stability needed to meet consumer expectations. The regulatory framework aims to promote financial stability and access to services, while regulators continue to seek solutions and guidelines that support innovation and allow new players to enter the market.¹⁷ The cross-border economic damage caused by the 2008 crisis and the global impact of the COVID-19 pandemic clearly show why a strong international financial regulatory system is urgently needed. As regulations have gradually loosened, capital is no longer tied to any single country. Thanks to networks of international bank branches and subsidiaries, money now moves quickly and flexibly around the world. Electronic transfers make these movements digital, eliminating the slow and costly need for cash or paper documents.¹⁸

Cross-border FinTech transactions create special challenges, mainly around jurisdiction, regulatory compliance, and international cooperation. Since FinTech services often operate across countries, they must follow multiple, often different, national regulations at the same time. This can increase administrative work and costs for companies. One major issue is determining which country's laws apply to a transaction. Different national financial rules make compliance harder and raise risks. Resolving disputes is also difficult, as parties may fall under multiple jurisdictions with different legal approaches. To address these challenges, international organizations and industry players call for common regulatory principles and standards. The goal is a more predictable, unified global environment that supports innovation, consumer protection, and financial stability.¹⁹ At the same time, the international regulation of FinTech is expected to become more complex and costly in terms of negotiations and decision-making, as emerging economies play an increasingly important role in shaping regulatory policies. While in the past rules were mainly set by developed countries serving as global financial centres – giving them a disproportionately large influence on world markets – today the interests of countries at the forefront of new technological innovations are also represented. This means that FinTech standards must now be developed with a broader range of economic actors, social fairness considerations, and diverse financial policy objectives in mind.²⁰

Internationally, FinTech is regulated very differently across countries. In the

¹⁶ Chander Mohan Gupta, Gagandeep Kaur, and Aryuni Yuliantiningsih, "Fin-Tech Regulations Development, Challenges, and Solutions: A Review," *Jurnal Dinamika Hukum* 24, no. 1 (2024): 124-141, 127, <https://doi.org/10.20884/1.jdh.2024.24.1.4074>.

¹⁷ Anyfantaki, "Evolution of Financial Technology," 61.

¹⁸ Yesha Yadav, "Fintech and International Financial Regulation," *Vanderbilt Journal of Transnational Law* 53, no. 3 (2020): 1109-1146, 1117, <https://scholarship.law.vanderbilt.edu/vjtl/vol53/iss3/10/>.

¹⁹ Mohamad Zreik and Badar Alam Iqbal, "Navigating the Global Fintech Regulatory Landscape: Balancing Innovation and Protection," in *Examining Global Regulations During the Rise of Fintech*, ed. Mercia Selva Malar Justin, Revenio Cabanilla Jalagat Jr., Kumar Chandar, Perfecto G. Aquino Jr., and Karima Sayari (Hershey, PA: IGI Global, 2025), 71-102, 84, <https://doi.org/10.4018/979-8-3693-3803-2.ch004>.

²⁰ Yadav, "Fintech and International Financial Regulation," 1142.

United States, FinTech regulation is complex because oversight occurs at both federal and state levels. Responsibility is split among multiple agencies, such as the Securities and Exchange Commission (SEC), the Commodity Futures Trading Commission (CFTC), and the Consumer Financial Protection Bureau (CFPB). Each agency focuses on a different area of the FinTech sector, creating a “light-touch” regulatory approach that encourages innovation and competition. However, the fragmented system is challenging for FinTech startups, as they must comply with multiple agencies’ rules and varying state regulations.²¹ The European Union takes a more unified approach to regulating the FinTech sector, notably through the PSD2²² and MiFID II²³ directives. These rules aim to create a single market for digital payments and strengthen consumer protection. The European Banking Authority (EBA) plays a central role by overseeing and coordinating FinTech regulation across member states. This approach simplifies regulatory requirements for FinTech companies operating within the EU and reduces fragmentation. However, it also poses challenges, as FinTech firms must comply with EU-wide rules that are often stricter than their own national regulations.²⁴

AI systems used to assess individuals creditworthiness or credit scores are considered high-risk because they significantly affect access to essential financial resources and services, such as housing, electricity, or telecommunications. The use of these systems can easily lead to unfair treatment of individuals or groups and may perpetuate or create new patterns of discrimination based on race, ethnicity, gender, disability, age, or sexual orientation.²⁵ In Hungary, the National Tax and Customs Administration²⁶ uses an application called Flexible Tax Audit Decision Support and Data Mining System²⁷. This system helps with risk analysis and identifying taxpayers for audit. Using machine learning, it analyses past cases to find patterns linked to high tax arrears and provides predictions about where similar issues might arise in the future.²⁸

EU financial regulations include rules on internal governance and risk

²¹ Zreik and Iqbal, “Navigating the Global Fintech Regulatory Landscape,” 78, 79.

²² Directive (EU) 2015/2366 of the European Parliament and of the Council of November 25, 2015, on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC, and 2013/36/EU and Regulation (EU) No. 1093/2010, and repealing Directive 2007/64/EC, *Official Journal of the European Union* L 337 (December 23, 2015): 35–127, <https://eur-lex.europa.eu/eli/dir/2015/2366/oj>.

²³ Directive 2014/65/EU of the European Parliament and of the Council of May 15, 2014, on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU (recast), *Official Journal of the European Union* L 173 (June 12, 2014): 349–496, <https://eur-lex.europa.eu/eli/dir/2014/65/oj>.

²⁴ Zreik and Iqbal, “Navigating the Global Fintech Regulatory Landscape,” 79

²⁵ Regulation (EU) 2024/1689 of the European Parliament and of the Council of June 13, 2024, laying down harmonised rules on artificial intelligence and amending Regulations (EC) No. 300/2008, (EU) No. 167/2013, (EU) No. 168/2013, (EU) 2018/858, (EU) 2018/1139, and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797, and (EU) 2020/1828 (Artificial Intelligence Act), *Official Journal of the European Union* L, 2024/1689 (July 12, 2024), <https://eur-lex.europa.eu/eli/reg/2024/1689/oj>.

²⁶ In Hungarian: Nemzeti Adó- és Vámhivatal (NAV).

²⁷ In Hungarian: Rugalmas Adóellenőrzési Döntéstámogató és Adatbányászati Rendszer (RADAR).

²⁸ Erzsébet Fejes and Iván Futó, “Mesterséges intelligencia a közigazgatásban – az érdemi ügyintézés támogatása [Artificial Intelligence in Public Administration—Supporting Substantive Case Handling],” *Pénzügyi Szemle*, no. 1 (2021): 24–51, 44, https://doi.org/10.35551/PSZ_2021_k_1_2.

management for regulated financial institutions, including cases where they use artificial intelligence (AI) systems. To ensure consistent application of the AI Regulation and EU financial rules, existing supervisory authorities should be designated to oversee the implementation of the AI Regulation, including market surveillance. Member states may also assign these tasks to other authorities if they choose. The designated authorities must have full powers to enforce the obligations under the AI Regulation and Regulation (EU) 2019/1020²⁹, especially for post-market monitoring, which can be integrated into existing financial supervisory structures. National authorities under the single supervisory mechanism must immediately inform the European Central Bank of any information affecting its prudential oversight if they also carry out market supervision. To strengthen alignment, some AI Regulation obligations – such as risk management, monitoring, and documentation – should be integrated into procedures under Directive 2013/36/EU³⁰. Limited deviations can be allowed, for example, for quality management systems or monitoring high-risk AI systems, to avoid overlap. The same approach should apply to insurers, reinsurers, insurance intermediaries, and other financial institutions with internal governance or procedural obligations under EU law. Providers subject to internal governance, operational, or procedural rules under EU financial services law are required to retain the log files automatically generated by their high-risk AI systems. This obligation must be fulfilled within the framework of the documentation requirements set out in the relevant EU financial services legislation.³¹ Providers subject to internal governance, operational, or procedural rules under EU financial services law are required to retain the log files automatically generated by their high-risk AI systems. This obligation must be fulfilled in accordance with the documentation requirements set out in the relevant EU financial services legislation.³² If a high-risk AI system is placed on the market, deployed, or used by a financial institution subject to EU financial services law, the market surveillance authority will be the national authority responsible for supervising that institution – provided that the use of the AI system is directly related to the provision of those financial services.³³

In the Asia-Pacific region, FinTech regulation varies widely. Singapore takes a proactive approach, encouraging FinTech startups through regulatory sandboxes and clear guidelines. In contrast, China has introduced strict restrictions on cryptocurrencies and digital payment platforms. Japan has created a comprehensive regulatory framework for cryptocurrencies, with a strong focus on consumer protection. Australia

²⁹ Regulation (EU) 2019/1020 of the European Parliament and of the Council of June 20, 2019, on market surveillance and compliance of products and amending Directive 2004/42/EC and Regulations (EC) No. 765/2008 and (EU) No. 305/2011, *Official Journal of the European Union* L 169 (June 25, 2019): 1–44, <https://eur-lex.europa.eu/eli/reg/2019/1020/oj>.

³⁰ Directive 2013/36/EU of the European Parliament and of the Council of June 26, 2013, on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC, *Official Journal of the European Union* L 176 (June 27, 2013): 338–436, <https://eur-lex.europa.eu/eli/dir/2013/36/oj>.

³¹ EU AI Act (158)

³² EU AI Act, Article 19.

³³ EU AI Act, Article 74, 6.

uses principle-based regulation, supported by sandboxes to promote FinTech innovation. The regulatory landscape in the region is constantly changing, reflecting each country's different approach and adaptability to FinTech developments.³⁴

In FinTech, the link between contract law and smart contracts is important, especially when things go wrong. A smart contract can fail in many ways. Even a simple payment – like A sending money to B on a certain date – can go wrong: the amount might be wrong, the payment could be late, sent to the wrong account, or depend on an event that is detected too early, too late, or incorrectly. This can lead to wrong payments or missed payments. It's important to manage these risks. Ideally, a master agreement explains who is responsible and how risks are shared. Insurance can also help cover losses. If the contract does not cover this, parties may have to use regular contract law or claim damages to fix the problem. Unclear rules increase the need for clear regulations to build trust and manage risks like errors, false data, or hacking.³⁵

In FinTech, data protection and security are very important because the industry handles sensitive financial information. FinTech companies process large amounts of personal and financial data, so keeping it safe is essential. Data protection ensures users personal information – like names, addresses, social security numbers, and financial history – is handled securely. In Europe, the GDPR sets strict rules for collecting, using, and storing this data. FinTech companies must follow these rules to maintain user trust. Data security protects against unauthorized access, data leaks, and cyberattacks. FinTech firms invest heavily in modern cybersecurity and encryption technologies. They also perform regular security audits and vulnerability tests to identify and prevent potential risks.³⁶

Future technology trends include new concepts such as casual AI, a type of artificial intelligence designed to work more like human decision-making. Other important ideas are sustainable cloud and open telemetry, which could play key roles in the next phase of technological development. In Hungary, the concept of decentralized identity is understood a bit differently. It usually refers to managing different types of data – like health, tax, education, or transportation records – independently but still accessible centrally. This is closely related to Big Data, which collects and analyses large amounts of personal data. However, decentralized identity may become less important because it relies on simple data connections, while AI can handle much more complex tasks. AI doesn't just find patterns; it can uncover deeper connections that humans cannot detect manually. For this to work, backend systems like databases and structured data sources must be reliable and stable. In the financial sector, precise data management is critical. There is no room for mistakes; for example, a bank cannot tell a client their salary or investment is "roughly" correct. Accurate, regulated, and reliable data handling is essential for financial systems to function properly.³⁷ The quality of

³⁴ Zreik and Iqbal, "Navigating the Global Fintech Regulatory Landscape," 79.

³⁵ Roger Brownsword, "Smart Contracts: From a Legal Perspective," in *Fintech Regulation and the Licensing Principle*, ed. Dário Moura Vicente, Diogo Pereira Duarte, and Catarina Granadeiro (European Banking Institute, 2023), 139-162, 152.

³⁶ Zreik and Iqbal, "Navigating the Global Fintech Regulatory Landscape," 83.

³⁷ Bagó, "Mesterséges intelligencia a pénzügyekben," 36.

data used by FinTech companies can worry regulators. Automated investment algorithms may rely on unreliable or new types of data, such as GPS, metadata, or social media. Understanding and verifying these data often goes beyond what regulators can handle. It is also difficult to assess how well a foreign FinTech solution fits the local financial infrastructure, payment systems, and risk management, and whether it might cause technical or market disruptions.³⁸ To reduce legal risks, providing appropriate test environments for FinTech companies can be very useful. In these regulated and controlled settings, companies can test new products and services under the supervision of authorities. This allows innovation while regulators can assess potential risks and develop suitable rules. It is recommended to use proportional regulation, so rules fit the size, risk profile, and complexity of each FinTech company. The goal is to create regulations that ensure risk management and consumer protection while supporting innovation. Social engineering³⁹ attacks can cause serious financial, legal, and reputational damage. Prevention requires strong authentication, awareness of common attack methods, regular employee training, and technical protections such as email filtering and access control.⁴⁰

Regulators could consider letting private companies create industry rules through self-regulation. Major firms like Apple, Facebook, Amazon, WeChat, or Alibaba could work together to develop common operating standards. This could reduce information gaps and lower administrative burdens if companies take on the rule-making role themselves. However, such private initiatives alone are likely not enough to balance the three main goals of FinTech regulation — innovation, financial stability, and fair access. Companies often hesitate to share sensitive data or algorithms and may not fully recognize the risks they pose. They might design standards that favour their own interests, disadvantage smaller players, or ignore the potential negative effects on the broader market. Similar challenges have been seen before in the self-regulation of the over-the-counter derivatives market. Thus, FinTech is increasingly becoming part of the traditional financial system, and regulators can easily fall behind its pace of development. Innovations that carry risks such as operational failures, data loss, excessive surveillance, or major financial collapses do not respect national borders or the citizenship of affected digital consumers.⁴¹ This makes it urgent to establish a well-developed international FinTech regulatory framework.

4. Conclusion

In conclusion, financial technologies strongly shape the way the modern financial system operates. The development of FinTech has passed through several important stages and has now reached the era of artificial intelligence. Today, computers can trade with each other, and many customer interactions are automated and

³⁸ Yadav, "Fintech and International Financial Regulation," 1136-1137.

³⁹ An attack technique that relies on manipulating and influencing people, aiming to obtain confidential information, gain access to systems, or spread malicious software.

⁴⁰ Gupta, Kaur, and Yuliantiningsih, "Fin-Tech Regulations Development," 137.

⁴¹ Yadav, "Fintech and International Financial Regulation," 1140.

occur without human intervention. It is clear that the development of financial technology has always gone hand in hand with the development of information technology. The digitalization of financial services is closely linked to the evolution of IT. For example, once mobile phones became technologically capable of supporting mobile banking, mobile banking services quickly appeared. A similar process occurred with online banking, since internet protocols and secure encryption solutions only became available and usable when the technological environment made them possible.⁴² Regulation is crucial in the FinTech sector because it ensures trust, security, and financial stability. Its primary goal is to protect consumers by safeguarding users' data and money from fraud and abuse. It also supports fair market operation by preventing manipulation and unfair competition. Furthermore, regulation helps reduce systemic risks that may arise from FinTech innovations, thereby protecting the stability of the entire financial system. In addition, it provides a framework for ethical operation, ensures transparency, and strengthens accountability within the industry.⁴³ In addition to EU regulations, the rapid development of technology makes it useful to create a specific guideline for financial institutions in Hungary. The aim would be to support the use of artificial intelligence while ensuring security, ethical decision-making, and lawful data management. A non-binding but professionally grounded recommendation could help support initiatives in the domestic market. Such a document could define key concepts, outline the main principles of AI use, and establish evaluation criteria. It could also suggest practical methods and processes that ensure the careful and secure use of artificial intelligence, while remaining flexible enough to adapt to future technological developments.⁴⁴

At the same time, global FinTech innovations carry risks; a failed product, a service outage, a cyberattack, or a bankruptcy can quickly affect other countries and many consumers. Even without a complete system collapse, these innovations pose significant challenges for everyday regulation. These include establishing common investor protection standards, ensuring data security, maintaining prudential reserves, fulfilling reporting and supervision obligations, and coordinating legal enforcement across jurisdictions.⁴⁵ We can also see that FinTech startups often face heavy compliance burdens. Their biggest challenge is that they must meet existing financial regulations while developing new technologies and business models; these rules differ from country to country. Operating internationally makes this even more complex, as they must follow multiple sets of regulations at once. This requires significant legal and operational resources, which can be especially difficult for startups with limited funding. Moreover, regulations constantly change alongside technological developments, so FinTech companies must continually adapt. This means they must spend large amounts on compliance systems, which can divert resources away from product development and innovation.⁴⁶ Furthermore, decentralized data flows and

⁴² Bagó, "Mesterséges intelligencia a pénzügyekben," 34-35.

⁴³ Zreik and Iqbal, "Navigating the Global Fintech Regulatory Landscape," 78

⁴⁴ Domokos and Sajtos, "Mesterséges intelligencia a pénzügyi szektorban," 164.

⁴⁵ Yadav, "Fintech and International Financial Regulation," 1134.

⁴⁶ Zreik and Iqbal, "Navigating the Global Fintech Regulatory Landscape," 86.

algorithms can connect the financial systems of different countries in ways that individual regulators may not fully understand. A FinTech solution might be licensed in one country but used in another, creating a dependency on the supervisory system of the licensing country. The regulator in the other country may not foresee the consequences of the technology being applied in a different market environment. International cooperation and information sharing are essential for regulators to better assess the cross-border risks and impacts of their decisions.⁴⁷ Moreover, the most effective way to address legal issues and risks – such as data protection, deception, and financial fraud – is to establish a comprehensive international regulatory framework, or at least a guiding framework that facilitates international collaboration.

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⁴⁷ Yadav, “Fintech and International Financial Regulation,” 1137.

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