Use of innovations by supervised entities in the financial market in Slovakia

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Glossary

Term	Description
AI	Artificial intelligence – the utilisation of computer systems capable of performing tasks that have traditionally required human intelligence. It is a broad area, a subset of which is machine learning. 'Machine learning' means as a method for designing a sequence of operations to solve problems that automatically optimises itself based on practical experience with little or no human intervention
AML/CFT	Anti-Money Laundering / Countering the Financing Of Terrorism
API	Application programming interface – a standardised interface for the secure and efficient exchange of data and functionalities between different software systems
Big Data	The storage and analysis of large or complex data sets using various techniques including artificial intelligence
Big Tech	Large global tech companies
BNPL	Buy Now Pay Later – a consumer credit product that enables customers to purchase goods or services for immediate delivery, which they pay for in pre-arranged instalments typically spread over several months.
Cloud	A technology platform that enables access to scalable computing resources (storage, servers, applications, computing power) as a service over the internet
DLT	'Distributed ledger technology' means the protocols and supporting infrastructure that enable computers in various locations to process and verify transactions and to update records in a synchronised manner across the network. Originally it referred to a specific implementation – a 'distributed ledger of transactions'.
FinTech	Financial technologies – the field in which technological innovations are applied to the provision of various financial services to create new business models, applications, processes or products, or to improve existing products or services, to increase their accessibility or adaptability to individual needs, or to reduce their cost
IoT	Internet of Things – a network of connected objects and devices equipped with sensors, software and other technologies that enable them to communicate and exchange data with other objects and systems
online onboarding	A process by which customers can open accounts or set up financial services entirely online without the need for physical contact
RegTech	Regulatory technologies – solutions that help financial institutions meet regulatory and compliance requirements. it can also refer to companies providing such solutions.
RPA	Robotic process automation – a technology supporting the configuration of software robots to automate structured, repetitive and rule-based tasks and processes
smart contract	Computer code in DLT (distributed ledgers of transactions) which ensures that all the contractually specified performances between the parties are executed automatically when the pre-defined conditions for them are met
SupTech	Supervisory technology – the use of innovative technologies by supervisory authorities to support their regulatory and oversight functions. It primarily facilitates more effective monitoring and analysis of data from financial institutions.

Introduction

The pace of digital transformation in the financial sector continues to accelerate and the very nature of financial services is undergoing fundamental shift. What was considered a technological breakthrough a decade ago is now the standard, with yesterday's visions becoming today's reality. In this dynamic environment, a systematic overview of the ongoing trends is crucial not only for effective regulation but also for maintaining the competitiveness of the entire sector.

In November 2024, Národná banka Slovenska conducted its third regular survey of the use of innovations using and expanding upon the methodology developed in two previous studies (2020, 2022) and taking inspiration from similar initiatives undertaken by foreign supervisory authorities. This two-year monitoring cycle makes it possible to capture both a snapshot of technology adoption at a given moment and the evolving dynamics – which innovations are gaining traction, which are losing their appeal and the factors driving these trends.

This year's survey reflects rapid development in both the regulatory framework and technologies. In addition to the traditional areas of monitoring (cloud computing, robotic process automation, digital onboarding), the survey has been expanded to include a topic that is increasingly shaping the future of the financial sector – artificial intelligence.

Special attention has been given to information security, which is an existential priority for the financial sector in an era of escalating cyberthreats and increasingly sophisticated attacks. The participants' responses provide an insight into how Slovak financial institutions balance innovation and security – two requirements that are equally vital but often in conflict.

NBS plans to conduct a fourth edition of this survey in 2026 to continue the established two-year cycle for monitoring technological trends.

Special thanks are due to all 110 respondents from the four key sectors of the financial market, whose detailed responses have contributed both to the establishment of a comprehensive picture of the state of financial innovations in Slovakia and the development of future regulatory approaches. The high level of engagement is strong support for our confidence that our findings faithfully reflect the current situation in the Slovak financial market.

1. Summary

NBS conducted its regular survey of innovation in the entities that it supervises between 4 November 2024 and 29 November 2024. A total of 110 respondents from four financial sectors took part in the survey, representing banking and payment services (26), insurance and pensions (29), capital markets (33) and financial intermediation (22).

The survey builds upon previous studies that NBS conducted in 2020 and 2022, maintaining continuity in methodology and structure to ensure data comparability over time. NBS regularly presents anonymised data from these surveys at domestic professional forums, international conferences and in working groups of the European Supervisory Authorities (ESAs), thereby contributing to the sharing of knowledge and the development of the regulatory framework for financial innovation.

Innovations, FinTech & Big Tech

The survey revealed two main innovation models in the Slovak financial market: 46.3% of respondents (predominantly large institutions) combine an international group strategy with a local approach, whereas 27.3% of entities (typically smaller capital market and brokerage entities) exclusively innovate at the local level through partnerships with third parties or through their own solutions.

Regarding the competitive position of FinTech firms, the sector reporting the strongest effect is banking and payment services. On the other hand, Big Tech firms tend to be seen in a complementary role and not as competitors.

The primary motivations for innovation remain market participants' focus on clients and adapting to market trends, with increasing profitability as a secondary factor.

Cloud, Big Data, robotic process automation (RPA) and Internet of Things (IoT)

Cloud solutions continue to take over the Slovak financial market with adoption reaching 79.1% (compared to 72% in the previous survey) with the leading sector being financial intermediation with a 90% adoption rate.

At the other end of the scale, Internet of Things (IoT) was the surprising laggard with adoption in just 7.3% financial institutions. Where IoT has been adopted, it has found truly innovative applications ranging from remote terminals and smart data visualisations in banking to sophisticated sensors that are used in insurance to monitor driver behaviour. Despite the potential shown by such case studies, IoT remains significantly underutilised in the financial sector.

Between these two extremes, two technologies are finding applications clustered in different sectors: Big Data has a strong position in the banking sector (predictions, credit risk assessment, dynamic pricing) while robotic process automation finds its strongest adoption in the insurance sector (62.1%), where it contributes to the optimisation of back-office functions.

Artificial Intelligence (AI)

Artificial intelligence is one of the hottest topics in current debates on technology. Its use in the financial sector is not new but recent regulatory changes have reignited discussion of fairness, ethics, bias and other aspects of its implementation.

In the Slovak market, AI adoption was reported by 41.8% of respondents, with significantly higher uptake in the sectors of banking and payment services (65.4%) and insurance and pensions (51.7%). The most common applications are document OCR and analysis, where AI excels in accuracy and efficiency. Chatbots, voice bots and process optimisation tools are also widely used.

A surprisingly high proportion of respondents – 91.3% of AI users – reported using generative AI. Most institutions only make such tools available to selected employees and combine in-house solutions with external services.

Respondents' primary concerns include security, cybersecurity and data protection. On the other hand, they had relatively little concern about talent shortages or the explainability of AI models for oversight.

Although Slovakia lags behind technological leaders like the United Kingdom and Sweden in international comparisons, the high level of generative AI adoption indicates significant potential for a transformation in productivity and processes in the domestic financial market over the next few years.

Online onboarding, mobile applications

Online onboarding has become the norm in the Slovak financial market with an implementation rate of 62% in the banking and payment services sector, an equal 62% in the insurance and pensions sector and 55% in the capital markets sector.

Despite the popularity of mobile apps, just 11% of respondents report that more than 80% of their new clients have used them in the last year. Moreover, their functionality is frequently limited. Safety factors, experience from the pandemic, and escalating cyber threats have led to a narrowing of the available product portfolio, the exclusion of services for the SME segment and more limited options for signing contracts electronically.

While mobile apps and online onboarding are well-established innovations in Slovakia, RegTech solutions are still seeing only marginal use. A hopeful sign is that financial institutions see it as a promising segment and report plans to adopt it in the medium term.

DLT, smart contracts and cryptoassets

The Slovak financial sector shows remarkably little enthusiasm for distributed leger technologies (DLT), smart contracts and cryptoassets. None of the survey respondents had such technologies in active use.

The entry into force of the MiCA Regulation has laid the foundations to build a regulated market in cryptoassets to emerge in Slovakia. Three established financial institutions with a long history of operating in the Slovak financial market have declared their intention to bring cryptoassets into their portfolio in the coming years. There is reason to believe that development in this sector will be driven primarily by specialised FinTech companies applying for licences under the MiCA Regulation but as they currently operate outside the regulated financial sector, they not included in the current survey.

Digital challenges

The final section of the survey shows that the regulatory requirements laid down in legislation like DORA, NIS2 and the AI Act are having a strong impact on innovation strategies in the Slovak financial sector. The top priority reported by a majority (67.3%) of respondents was security and cyber resilience.

In second place was API interfaces, which are especially important for the development of open banking and broader concepts related to open finance. The third-ranking area, biometrics and digital onboarding, received surprisingly low ratings.

In the long-term perspective, respondents assign artificial intelligence a significant but not revolutionary role – 53.6% gave it a medium or higher rating for strategic importance.

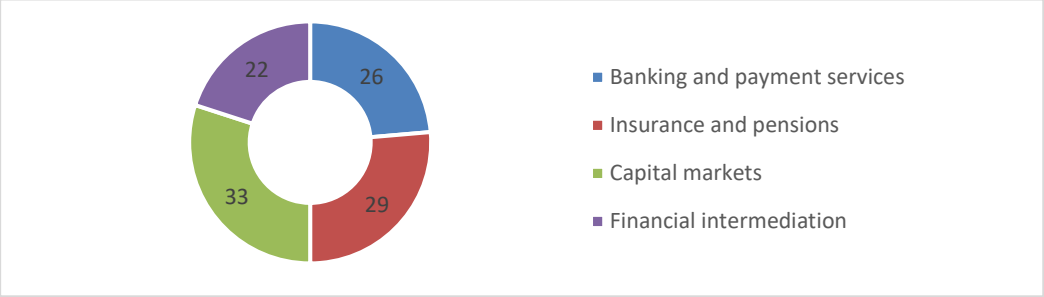
2. Innovations, FinTech & Big Tech

2.1 Survey methodology and selection of respondents

The survey was carried out online between 4 and 29 November 2024. A total of 110 respondents from various sectors of the financial market took part. These included both Slovak financial institutions and the branches of foreign financial institutions operating in the Slovak market. The survey was carried out using an online questionnaire that included various question types – single-select, multi-select and open questions.

All market undertakings resident in Slovakia were contacted based on the current data recorded in the Financial Entities Register of Národná banka Slovenska.[1] An exception was made for the financial intermediation sector because it includes thousands of entities and therefore the questionnaire was sent only to the most significant operators in terms of profits and turnover.[2]

Chart 1: Respondents by financial sector (number of responses)



In line with previous surveys, the respondents were divided into four main sectors:

1) Banking, payment services and electronic money (which covers banks, payment institutions and electronic money institutions), hereinafter referred to as “banking and payment services”;

2) Insurance and pension saving (which covers insurance companies, pension fund management companies and supplementary pension management companies), hereinafter referred to as “insurance and pensions”;

3) Securities markets, collective investment and crowdfunding service providers (this category includes several types of undertaking, in particular securities dealers, the stock exchange, crowdfunding service providers and management companies), hereinafter referred to as “capital markets”;

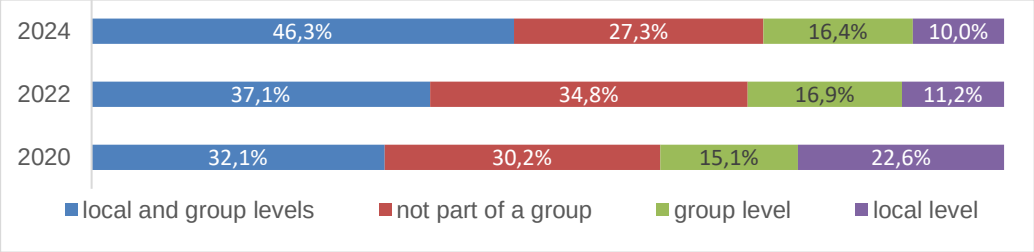
4) Financial intermediation (which covers the most prominent independent financial agents), hereinafter referred to as “financial intermediation”.

2.2 Approaches to innovation

The first part of the survey includes questions on approaches to innovation, how innovations are implemented, how innovations are used and the respondents’ plans for the future.

[1] https://subjekty.nbs.sk/sk/
[2] Finreport 2023

Chart 2: Year-on-year comparison of innovation implementation methods



The responses suggest that an increasing number of supervised entities are implementing innovations in a combined manner – concurrently at both the parent group and local branch levels. In 2024, this approach was chosen by 46.3% of respondents, making it the most frequently selected method and confirming the continuation of the growth trend since 2020. It reflects efforts to efficiently leverage innovations within groups while respecting local specifics and regulatory requirements.

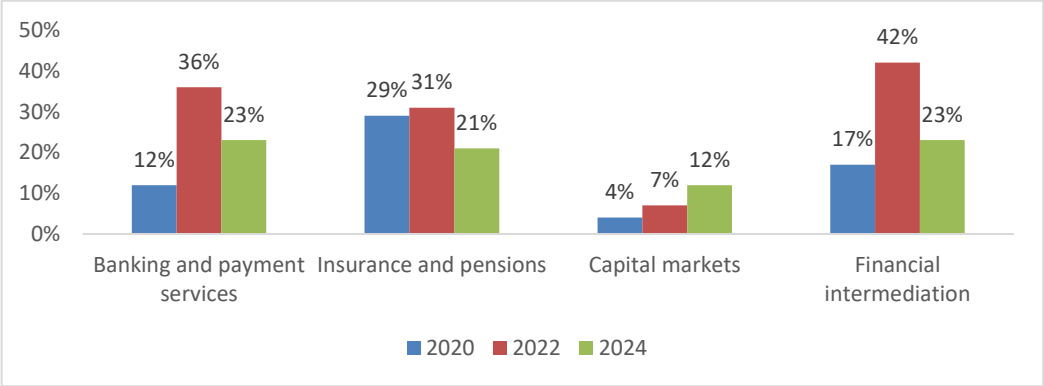
Among respondents who are part of a group, recent years have seen a clear movement away from innovating entirely on the local level. The adoption of group-level solutions is often more efficient than developing localised solutions so it is no surprise that undertakings that are part of multinational groups are gradually cutting back on entirely local innovations.

The second largest group of respondents consists of undertakings that are not part of groups and therefore implement innovations by themselves, often on a limited scale.

In 2024, most respondents preferred a combination of approaches. This was the result in banking and payment services (9), insurance and pensions (23), capital markets (10) and financial intermediation (9).

On the other hand, 27.3% of the overall group of respondents are not part of any group and therefore tend to adopt innovations on an individual basis, making their own decisions and using their own resources. The sectors where this is most common are capital markets (16) and financial intermediation (8). The sector with the most innovation happening entirely on the local level in 2024 was banking and payment services (5), where the undertakings are large enough to develop their initiatives with their own funds.

Chart 3: Development of cooperation with other entities in implementing innovations over time



The level of supervised entities' cooperation with other entities in the development and implementation of innovations in 2024 is highest in the banking and payment services sector and in the financial intermediation sector. At the moment, it is slightly lower in the insurance and pensions section and lowest in the capital markets segment. In the first three of these sectors and across the total respondent base, interest in this form of cooperation increased between 2020 and 2022 and then fell back in 2024. Undertakings in the capital markets sector remain relatively unenthusiastic about cooperation although there is an upward trend. Respondents focus primarily on security and exchange of information though they are also interested in the opening of asset accounts.

Supervised entities typically cooperate on innovations not only with other supervised entities but also with entities providing financial and technology services outside the scope of regulation (e.g.

FinTech, Big Tech, third parties providing outsourcing). This explains why the levels and forms of cooperation can change significantly over time.

The trends may be related to the fact that respondents often cooperate with supervised entities only in narrowly-defined areas of common interest on a long-term basis. On the other hand, they also cooperate with certain technology companies in ways that can offer more flexibility. For example, they often support their operations with technological solutions and products from FinTech and Big Tech companies. Such companies do not currently need authorisation for operations related to financial markets. This situation could change in the future, for example as a result of changes in the European regulatory frameworks. In such a case, there would be an increase in the number of respondents cooperating with supervised entities.

In 2024, the ranking of sectors in terms of cooperation was banking and payment services (6), insurance and pensions (6), financial intermediation (5), and capital markets (4).

The respondents gave examples of such cooperation based on an open-ended question (Note: not all respondents who answered positively gave details of areas of cooperation).

Table 1
Examples of areas in which respondents cooperate with supervised entities

Banking and payment services	**Insurance and pensions**
• "PSD2":[3] use of a payment facilitator in transactions, acceptance of payment instruments, payment processing, aggregation of payment methods and instruments, cooperation with card companies • Assessment of entities' solvency	• Cooperation with independent financial agents ("IFA") • For example, bancassurance, distribution of insurance products through banks • Provision and operation of sales tools and channels
Capital markets	**Financial intermediation**
• Opening of asset accounts, settlement of transactions • Knowledge sharing in the area of IT security • Cooperation on projects in areas of common interest	• Cooperation within the group, particularly with other IFAs and financial institutions • Comparison platform for products and services • Online insurance

In the present survey, respondents report active cooperation with supervised entities related to sharing solutions and mutual distribution of products and services. This happens most often within groups. Another current trend is the adoption of online solutions for business models and platforms offering comparisons of products and services. It is also possible to observe respondents' interest in distributing financial products and services online. These are well-established as principal areas of cooperation.

The level of cooperation with supervised entities may increase in future as more entities are brought within the scope of regulation (as in the case of "MiCA"[4] and cryptoasset service providers).

NBS supports financial innovations through two key instruments: the Innovation Hub and the Regulatory Sandbox. The Innovation Hub, established in 2019, enables entrepreneurs with a realistic FinTech business plan to consult with NBS experts on financial market regulation to help the ensure the correct implementation of innovative products and services. The Regulatory Sandbox, launched in January 2022, provides a platform for testing financial innovations in a real-world environment under NBS supervision that enables to participants to configure their innovative products to comply with the regulatory framework in dialogue with NBS. This kind of infrastructure for innovation is standard practice in most EU countries (according to a report of the European Supervisory Authorities issued in October 2023,[5] the European Economic Area has 41 innovation hubs and 14 regulatory sandboxes).

The survey results show that the sector with the strongest interest in using the sandbox is banking and payment services.

The seven respondents who expressed interest in using the sandbox in the 2024 survey broke down by sector as follows: five respondents from the banking and payment services sector, one from capital markets and one from financial intermediation.

[3] Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market.
[4] Regulation (EU) 2023/1114 of the European Parliament and of the Council on markets in crypto-assets and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937.
[5] https://www.eiopa.europa.eu/system/files/2023-12/Joint%20ESAs%20Report%20on%20Innovation%20Facilitators%202023%20-%20innovation%20hubs%20and%20regulatory%20sandboxes.pdf

Typical aims for sandbox testing include configuring products such as digital mortgages, implementing innovations in acquiring payment transactions, or the life cycle of electronic money. Other aims mentioned by respondents included the development of "Idea-app management software", innovations related to the regulatory framework for payment services, automated AML checks and the implementation of biometric solutions. One respondent also mentioned the implementation of an electronic bulletin board for loan administration.

On the other hand, 49.1% of respondents said that they did not know whether they would be interested in using the regulatory sandbox in future. Another 44.5% of respondents said that they were not interested in using sandbox services. This indicates that moving forward there will continue to be a relatively large group of currently undecided potential sandbox users.

2.3 Relationships with FinTech companies

While the level of cooperation between respondents and supervised entities shows a moderate rising trend, developments in relations between supervised entities and FinTech companies are more varied. A significant number of respondents report working with FinTech companies and also planning to cooperate in future. On the other hand, there are some respondents who have no intention of cooperating with such firms now or in the future. These tend to be smaller undertakings in the capital markets sector.

There were two respondents who said that they are not only cooperating with FinTech companies but also investing in them. One was a capital markets undertaking referring to investment portfolio management on a digital platform. The other was a respondent in the insurance and pensions sector referring to cooperation with a supplier of AI technology that is also the co-owner of this provider of AI services for the financial sector.

The sector with the most respondents reporting collaboration with FinTech companies is insurance and pensions (13) followed by banking and payment services (11), capital markets (7) and financial intermediation (3).

At the same time, many respondents have no plans for cooperation with FinTech companies either now or in the more distant future (35.4%). Respondents of this type are most common in the capital markets sector and financial intermediation. The table below shows examples of respondents' cooperation with FinTech companies given in response to an open question.

Table 2

Examples of areas in which respondents cooperate with FinTech companies

Banking and payment services	Insurance and pensions
• Cooperation in the development of alternative digital payment methods, in invoicing • The area of AI and language models • Biometric solutions, mobile POS terminals, AML/KYC, security	• API technologies, agent technologies • Bank ID, downloading of data and information from freely available electronic databases • Procedural changes, sales chatbot, insurance contract arrangement, client identification processes, electronic signing of documentation
Capital markets	**Financial intermediation**
• Investment portfolio management on a digital platform, trading platform including analytical tools • Payment gateway, online platform, AML checks • Biometrics and identity checks, AML screening	• Financial calculators and financial comparison websites • Data mining from publicly available electronic databases, digital signing of documents • Research and development in the field of language models

The present survey shows that FinTech companies are mainly seen as competitors for the banking and payment services sector (6) and the capital markets sector (5), and to a lesser extent for financial intermediation (2).

From the perspective of concerns, 13.6% of respondents expected FinTech companies to become competitors within three years and 24.5% expect it to take longer than three years. The sector with the most expressions of concern about this was financial intermediation (8), followed closely by insurance and pensions (7) and capital markets (7).

In the banking and payment services sector, 23.1% of respondents said that they do not yet see FinTech companies as their competitors but they expect competition to arrive within 3 years. A total of 34.6% of respondents in this sector do not see them as competitors either now or in the future. The sector where FinTech companies are mostly likely to be seen as non-competitors is insurance and pensions (65.5%), followed by capital markets (51.5%) and financial intermediation (45.5%).

On the other hand, banking and payment services were most likely to see them as competitors. The relatively high percentage of respondents answering in the negative points to a potential ambiguity in how respondents understand cooperation with FinTech companies: it could be active collaboration or possibly a scenario in which undertakings are not in competition with each other, a sort of coexistence.

A comparison of trends over time (in the tendency towards cooperation with FinTech companies and their perception as competitors) shows notable similarities. The trends show similar positive and negative associations (cooperation yes, competition yes – mainly banking and payment services, cooperation no, competition no – mainly in capital markets). These are attitudes to Fintech companies as competitors which respondents have shown for a long time and which have remained unchanged despite changes in the financial market.

Two of the respondents identified themselves as FinTech companies despite being licensed and supervised entities. They see themselves as innovative startups who compete with other supervised entities using their recent innovations.
In response to an open question on the areas in which they see FinTech companies as competitors, the respondents mentioned the following:

Table 3
Examples of areas in which FinTech companies compete with the respondent

Banking and payment services	Insurance and pensions
• Products and services related to payments and loans • Process efficiency, introduction of new payment methods, enhancements to customer experience, security, establishment of an e-commerce platform for products and services, payment gateway • The respondent sees itself as a FinTech company in competition with traditional market players	No response
Capital markets	**Financial intermediation**
• Competition, for example, from low-cost brokers and banking applications that provide simple ways to invest or gain access to capital markets • Easier access to financial markets for customers, pressure on fees, competitive offerings • Acquiring and retaining clients	• The process for gathering information from clients • Full customer service provided digitally

Respondents see FinTech companies as significant competitors in the area of payment services and related solutions. They emphasise the added value the FinTech companies offer in the area of payment services, their support, their offering of new digital solutions and lower costs. Many mention that such companies offer a better and more attractive portfolio of services and a higher quality of customer service.

In the capital markets sector, respondents indicate that the main advantage of such companies is their focus on technology, which significantly enhances processes, reduces service time and lowers costs. These innovations increase customer satisfaction.

2.4 Relationships with Big Tech companies

Big Tech companies are expanding their involvement in the financial market as technology partners, often describing themselves as “third party providers”.

In this position, they are becoming key partners for supervised entities in the development of internal systems and customer-facing innovations. At the same time, they are potential competitors because they are gradually expanding their own service offerings, which could compete directly with traditional financial institutions.

Table 4
Big Tech

‘Big Tech’ refers to the big global tech companies such as Alphabet, Amazon, Ant Group, Apple, Meta, Microsoft and so on. They have millions and even billions of customers all over the world.

Each specialises in a specific area of technology such as search (Google), e-commerce (Amazon), or social networks (Meta). They may provide support software (Microsoft) for households and businesses.

Their unique position in the market gives them access to vast amounts of user data. Some of them also operate in regulated areas of business: they are authorised to provide payment services as payment institutions or electronic money institutions. They often hold a near-monopoly position in their part of the market and set trends in products and services.

The sector with the highest level of cooperation with Big Tech companies is insurance and pensions (72.4%) followed by banking and payment services (61.5%). Distinctly lower levels of cooperation are reported in capital markets (21.2%) and financial intermediation (36.4%).

The trend in individual respondents' cooperation with Big Tech companies shows stabilisation over time. In Slovakia, these companies are mainly used for support activities. These include front office and back office solutions, work tools for document sharing and communication both at home and in the workplace.

Big Tech companies offer a wide range of technological solutions to address needs from office work to critical service infrastructure. These include well-known office suites, cloud infrastructure, and communication and advertising platforms with a global reach. These types of "cooperation" – mostly involving the use of support offerings – are reported by the vast majority of respondents. Respondents may not all have understood the questions on cooperation with Big Tech companies in the same way. Some respondents mentioned the widely available products referred to above that are used in nearly all companies, not just in the financial market sector. Other respondents understood the question in narrower terms and gave examples only from more significant business collaborations with the Big Tech companies.

Overall, 47.3% of respondents reported cooperation with Big Tech companies with the largest number of cooperating respondents in the banking and payment services sector (16) followed by insurance and pensions (21), capital markets (7) and financial intermediation (8).

In addition to support functions, some respondents use Big Tech business products in the form of applications, products, and services, such as electronic wallets, white label and smart solutions, payment gateways, and call centres. Some use them for wider marketing purposes.

Big Tech companies are perceived as competitors in the banking and payment services sector (4), which is very similar to the situation two years ago. As regards the motivation for mutual cooperation, the main reason mentioned by respondents is strong IT infrastructure (including software) and their competitive proprietary payment solutions and technologies that benefit the owners of their devices. Other sectors are less concerned about current competition from the Big Tech companies.

On the question of whether Big Tech companies will become competitors in future, concern is strongest in the banking and payment services sector (5), insurance and pensions (9), capital markets (7) and financial intermediation (5).

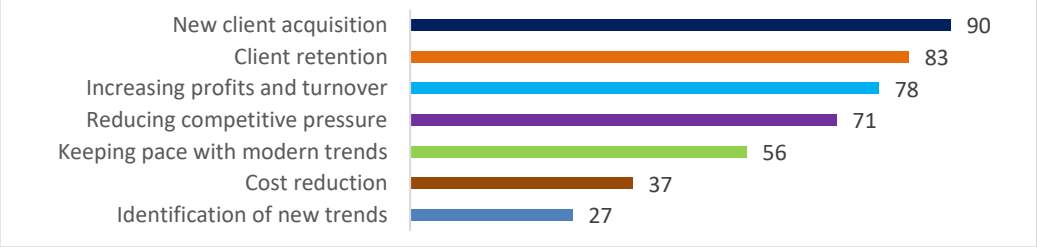
At the same time, 72.7% of respondents do not see Big Tech companies as competitors, which may be related to the fact that their main role is currently to provide support services.

2.5 Motivation to innovate

The motivation to innovate can vary among different market participants. Some introduce innovations to differentiate themselves from the competition and thereby attract new clients. For others, innovation is a way to improve and automate processes to reduce the company's operating costs.

As in previous surveys, the questions were presented with the option to choose multiple answers. The aim was to identify the primary cause for implementing innovations. We were also interested in the specific innovations that respondents have implemented in the recent past (the last two years) and plan to implement in the near future (the next two years).

Chart 4: Motivation to innovate



The answers from respondents in different sectors are relatively similar and are consistent with the overall results across all sectors.

The most widespread motivation for innovation in the banking and payment services sector is acquiring of new clients (20). In insurance and pensions, the most frequently reported aim is to keep pace with modern trends (23). The most frequent motivation for undertakings in capital markets is acquiring new clients (28) and the same applies for the financial intermediation sector (21).

The motivations with the lowest overall response scores were reducing competitive pressure (24.5%), identification of new trends (33.6%) and increasing profits and turnover (50.9%). Trends were once again uniform across all sectors.

The responses suggest that respondents primarily see innovation as an element that interests and attracts new clients, retains existing clients and enables the respondents to keep pace with modern trends in the financial market. Innovation also helps respondents to differentiate themselves but the client is always at the centre of their strategy.

Respondents were also asked about examples of the specific innovations whose implementation they consider most important in a two-year timeframe. They were asked to review the last two years and look forward into the next two years. The question allowed an open-ended response.

Table 5

Innovations in the last two years and future innovation plans

Banking and payment services

Innovations implemented in the last 2 years	Planned innovations of the next 2 years
• Implementation of instant payments • Introduction of digital products and services such as online onboarding, including for international clients, Buy Now Pay Later (BNPL) and Click to Pay • Creation of a mobile app for children, visualisation of client expenditure, technology for verifying the identity of calling clients	• Innovations in the area of digital products, services and assets, AI, electronic wallets • Increased use of paperless processes (support for ESG) • Digital mortgage for non-clients, intelligent consumer loan refinancing in digital channels, quick consumer loans • SEPA instant payments

Insurance and pensions

• Automation (e.g. contracts), digitalisation, implementation of an API for business partners, electronic solutions, web • Pilot activities relating to the introduction of AI, creation of an API for modelling and setting insurance premiums • Web application for photographic inspections of a motor vehicle in relation to insurance claims supported by artificial intelligence	• Use of AI for agents: assignment of potential customers to agents, smart search, task prioritisation, onboarding/training assistant • Chatbot, voice bot, transition to a microservices architecture, facial biometrics • Digitalisation of processes aimed at reducing costs, for example automation of e-mail communication, extraction of data from photographic documentation and automation in general

Capital markets

• Innovations in the field of IT security and product improvements, new and innovative products • Sending of documentation by e-mail, electronic signature • Online onboarding and automation	• Implementation of legislation on AI and “DORA” • Use of Big Data for targeted marketing • New online products integrating AI, and improved products and services • Online onboarding • AML improvements

Financial intermediation

• Digitisation of internal documents, electronic signing, IT optimisation • API integration with business partners and digitalisation, new Calculator (Universal) • Implementation of biometric technology and AI	• Facial biometrics and electronic signatures, incorporation of AI into customer care • Innovations to improve security and digital resilience • Improved configuration of the client portal

Digital transformation, security and the electronic delivery of products and services were key areas of innovation for respondents across the whole financial market. They improve processes and the client experience.

Improving existing products and services is important for many respondents. Innovation focuses on areas like biometrics, online onboarding, user-friendly processes and the electronic signing of documents and contracts. Many see the updating and upgrading of systems as part of innovation. They improve workers' interactions within the firm and with clients.

A special case is the implementation of instant payments in the banking and payment services sector, which several respondents mentioned as one of their priorities. Slovakia's instant payment scheme kicked off with the participation of its three largest banks on 1 February 2022. Under applicable regulation,[6] all relevant market participants must make available both incoming and outgoing instant payments by 9 October 2025. This explains the urgency that respondents in the segment placed on instant payments.

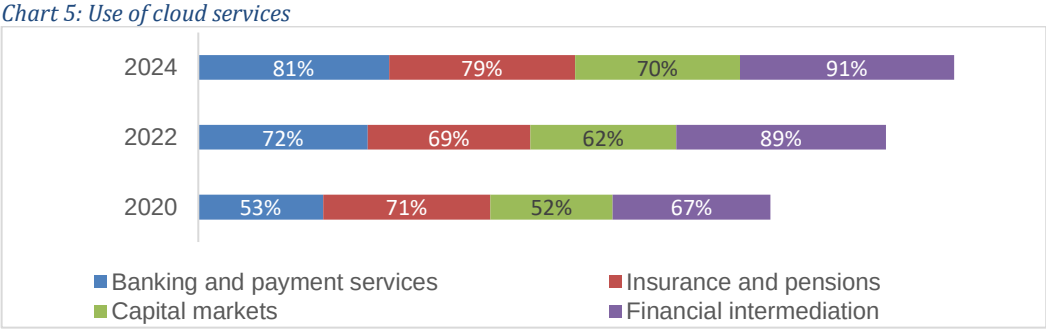
There are several other processes and priorities that respondents often refer to as innovations. For example, improvements to websites and mobile apps, integration and improvements for product calculators, improvements of online comparison tools. They likewise refer to the implementation of automated reporting and the use of AI (chatbots, voice bots). These are improvements in configurations and processes.

Respondents are diligently preparing for changes in the regulatory framework relating to security such as the DORA regulation and the NIS2 directive.[7] Cost reduction is a priority especially as regards the implementation of fully-digitised, paperless and electronic processes.

3. Cloud, Big Data, robotic process automation (RPA) and Internet of Things (IoT)

Cloud services have almost saturated all the studied sectors of the Slovak financial market. They are currently used by around 90% of respondents and their popularity continues to grow.

Chart 5: Use of cloud services



The greatest uptake of cloud services was reported in the financial intermediation sector, where they are used by over 90% of respondents (20) while reported use is lowest in the capital markets sector, where adoption is just 70% (23).

Specific examples of cloud service use reported in each sector are shown in the table below.

Table 6

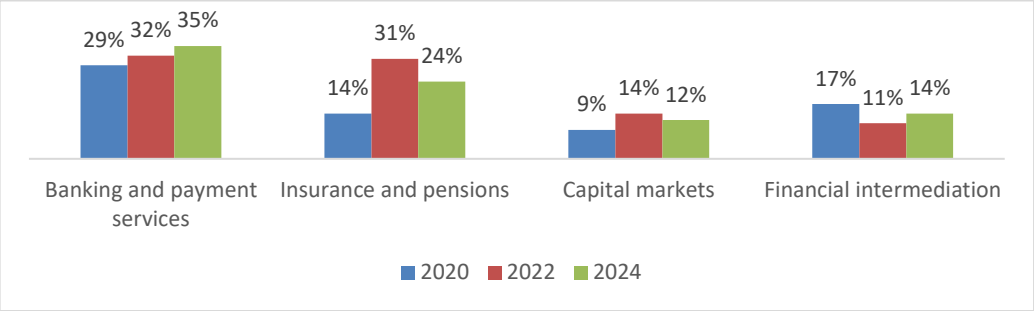
[6] Regulation (EU) 2024/886 of the European Parliament and of the Council of 13 March 2024 amending Regulations (EU) No 260/2012 and (EU) 2021/1230 and Directives 98/26/EC and (EU) 2015/2366 as regards instant credit transfers in euro.
[7] Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union, amending Regulation (EU) No 910/2014 and Directive (EU) 2018/1972, and repealing Directive (EU) 2016/1148 (NIS 2 Directive).

Examples of cloud service use in different sectors of the financial market

Banking and payment services	Insurance and pensions
• For example, products and services – MS Office, MS Teams, MS Azure, video conferencing, various types of application and communication methods, SharePoint, e-mail • Internal process, infrastructure and cloud-based applications (SaaS) • Optimisation and improvement of several processes	• Office 365, MS Teams and various AI tools, sharing, communication • Backup, data and information solutions, teamwork • PAAS (payment as a service), operating services (data platform, integration platform, website, web apps), in the context of machine learning
Capital markets	**Financial intermediation**
• E-mail communication – MS Office 365 Cloud, data backup, internal processes, data storage • Operation of an online crowdfunding platform, data storage, online communication • Virtual data centre	• Internal file sharing, work and study materials • Central records system, data storage, e-mails • Hosting, accounting, e-mail backup, e-mail records

Data is now being generated in unprecedented volumes – not only in the financial sector but also in the digital realm and beyond. Systematic data collection and processing using advanced analytical tools provides deeper insights into user behaviour, the identification of patters and predictions of future trends. Data inputs are becoming a key resource for informed decision-making, optimisation of internal processes and the creation of personalised financial products and services. 'Big Data' refers to extremely large, rapidly changing and diverse data sets that exceed the processing capacity of traditional database tools. Big Data tools are used to assess credit risk, detect fraud and manage dynamic pricing and real-time marketing. Big Data tools are thus the foundation for new business models and innovations tailored to clients' needs.

Chart 6: Comparison of Big Data use over time



In the present survey, Big Data use was reported most often in the banking and payment services sector (9) and least often in the capital markets sector (4).

Specific examples provided in response to an open question about Big Data use are shown in the table below:

Table 7

Examples of Big Data use in different sectors of the financial market

Banking and payment services	Insurance and pensions
• Advanced analytics, Customer Relationship Management, reporting, key performance indicators, fraud prevention, marketing, tracking client attrition • For the purposes of global banking, to analyse client behaviour • Risk mitigation, improvement of business outcomes, cost optimisation	• Analysis of the market, customer requirements, data quality, Customer Relationship Management • Generation of real-time reports on selected criteria, pricing radar, segmentation • Support for AI tools
Capital markets	**Financial intermediation**
• Analysis of the historical development of companies to set future strategies based on various criteria, research • Improvement in customer service, attracting new clients, increasing revenue and profits • In the parent branch	• Statistics • Improved understanding of clients' needs and better service quality • Business intelligence, smart applications

Another significant technology for market participants is robotic process automation or RPA. Like Big Data, RPA involves the use of complex software tools. However, RPA is focused on process

improvement. The survey responses indicate that use of this technology has increased in recent years.

Table 8
Robotic Process Automation (RPA)

RPA or robotic process automation is a process automation technology that uses virtual software robots to carry out time-intensive work or tasks usually performed manually. In this case, a software robot is a computer program designed to perform specific functions. Robotic process automation focuses on:

- Manual or repetitive tasks such as interacting with data from multiple sources
- Tasks involving large volumes of data: for example data migration and approval workflows
- Various system tasks: access to various applications such as web apps, solutions, third-party software.

In general, RPA often replaces routine manual processes, minimises errors, speeds up work and reduces costs. RPA assists in achieving the following objectives:

- Increasing productivity
- Eliminating human error
- Risk management
- Improving corporate agility
- Increasing process transparency

All these elements contribute to a company's success by improving performance and reducing costs.

The survey results show that the sector with the highest level of RPA is use in insurance and pensions (62.1%, 18 respondents). The lowest levels are in the financial intermediation sector (22.7%).

The responses show that RPA is used mainly by larger financial market players, especially the larger banks and insurance companies. This may be because larger entities typically have more processes that are suitable for automation or it could be because large organisations can achieve greater improvements from automation due to economies of scale.

The table below sets out additional information on respondents' use of RPA.

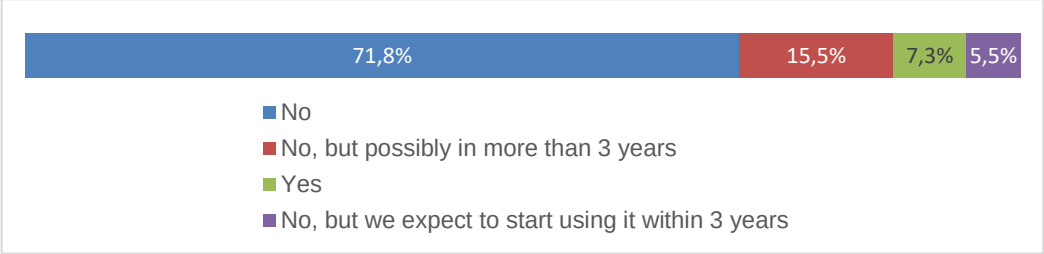
Table 9
Examples of RPA use in different sectors of the financial market

Banking and payment services	Insurance and pensions
• Mainly in back-office processes, to increase efficiency • Software testing automation, processing of requests and enforcement orders • Extraction and processing of invoice data	• Automation of manual processes related to claim adjustment, back office • Rapid automation of operational processes in applications, reporting, administration of insurance contracts • Automated testing
Capital markets	**Financial intermediation**
• Evaluation of clients' risk profile (ID, AML), processing • of bulk middle-office and back-office processes, trading, automated transaction calculations, transaction settlement • Higher efficiency and lower error rates in repetitive manual processes, especially report preparation • Back-office processes associated with data import for OTC transactions	• Testing the availability and functionality of applications, streamlining back-office processes • Forms and repetitive activities • Analysis of information system data to improve service quality

Internet of Things (IoT) is a general term for technologies that connect devices, objects and people via Wi-Fi or Bluetooth. Such connections offer new forms of control and monitoring or channels to provide advanced services. Thanks to the built-in sensors and collected and transmitted data, an application can present an overview of information such as the number of steps walked in a day, the intensity of physical activity, distance travelled and location. The results of data analysis can be used to recommend changes, e.g. reduce stress levels, visit a doctor, or they can be shared for further processing.

IoT functions in a similar way in the financial market, where the sector with the largest reported use is banking and payment services (11.5%) and the sector using it least is capital markets, where no respondent mentions it. The vast majority of respondents are not currently using IoT.

Chart 7: Use of IoT technology by respondents in 2024



Specific examples of IoT use are shown in the following table (not all respondents who answered "yes" gave specific examples of IoT use):

Table 10
Examples of IoT technology in use

Banking and payment services	Insurance and pensions
• Connecting bank terminals and displaying data • Remote access via VPN (virtual private network). Connecting mobile phones and notebooks	• Remote building management • Motor vehicle insurance • Evaluation of client's driving behaviour
Capital markets	**Financial intermediation**
Not specified	• Increasing office efficiency • Installation of sensors

Respondents who do not currently use and have no plans to utilise IoT in future are evenly distributed across all four sectors. Overall, they make up 71.8% of respondents. This indicates that IoT still has far to go to transition from home and office equipment and to the supervised financial market.

4. Artificial Intelligence (AI)

We have decided to dedicate a whole chapter to artificial intelligence (AI) in view of the urgency with which it is being discussed around the world. We were interested in the areas where it has been deployed in finance and the level of adoption.

The survey asked respondents to what extent they had adopted AI and what purposes they used it for. We also wanted to understand how respondents have integrated AI in their organisation and how they perceive its associated risks.

Table 11
Artificial Intelligence

In the broad sense, **Artificial Intelligence (AI)** is the use of digital technologies to perform tasks usually thought to require human thinking, decision-making , learning, planning or creativity. AI systems try to emulate human intelligence to process information faster, more efficiently and on a larger scale than a human being is able. The concept of artificial intelligence emerged in the 1950s but practical applications have only really taken off in the last decade – mainly thanks to increases in computing power, the availability of large datasets and advancements in machine learning algorithms. Artificial intelligence is now present in everyday applications from virtual assistants through facial recognition, chatbots and self-driving vehicles to personalised recommendations in e-commerce and automated translations. In **financial services**, artificial Intelligence is applied in areas such as fraud detection, credit risk assessment, investment portfolio management (commonly referred to as robo-advisory), compliance automation, predictive analysis and personalisation of services for clients. Financial

institutions use AI not only to increase their efficiency and accuracy but also to design new products and optimise internal processes.

For many years, artificial intelligence had no governing framework in law. This state changed on **1 August 2024** when the **Regulation on artificial intelligence (AI Act)** entered into force. Its aim is to establish a consistent and transparent regulatory framework for the safe and ethical use of AI in the European Union.

The **AI Act** establishes a risk categorisation system based on a technology's effects on fundamental rights and safety. It distinguishes between:

- **unacceptable risk** (systems that will be completely prohibited such as systems for social scoring);
- **high-risk systems** (e.g. AI use in employment, healthcare and financial services);
- **limited risk systems** (e.g. chatbots that are required to disclose that they are based on AI);
- **minimal-risk systems** (e.g. recommendations on streaming platforms).

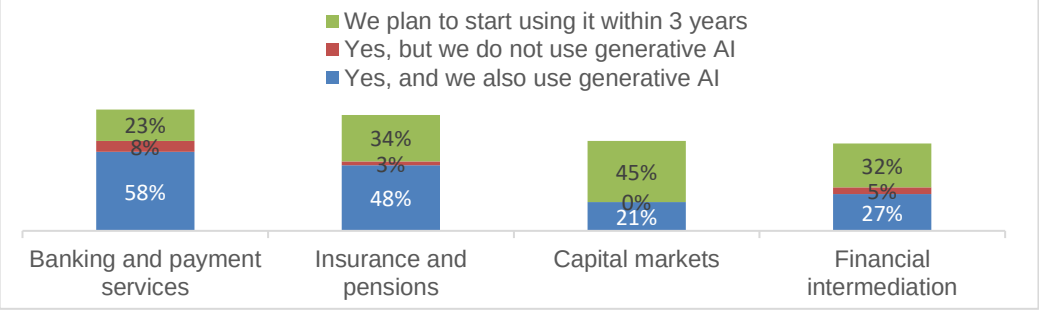
The regulation applies not only to the developers of the technology but also to users that implement AI systems. The AI Act will take full effect **within 36 months of its entry into force** but some obligations will start to apply sooner – especially for generative AI systems and high-risk applications.

Nearly half of respondents (41.8%) said they were currently using AI. The sectors with the highest adoption were banking and payment services (65.4%) and insurance and pensions (51.7%). The lowest reported AI use was in the capital markets sector (just 21.2%).

The responses suggest that nearly all respondents using AI are also using generative artificial intelligence,[8] especially in the sectors of banking and payment services as well as insurance and pensions. The percentage of AI users reporting generative AI use was 91.3%.

When compared with the findings of earlier surveys, the rapid growth of AI becomes clear. Whereas 5.7% of all respondents mentioned using AI in 2020, the percentage increased to 20.2% in 2022 and the previously mentioned 41.8% in 2024.

Chart 8: Use of AI across sectors in 2024



The Sectors with the highest adoption of AI were banking and payment services (17) as well as insurance and pensions (15). The sectors reporting the least use were capital markets (7) and financial intermediation (7).

A general overview of AI use in the financial market is provided in the chart below, which is based on a question where respondents could choose multiple options:

[8] Such as ChatGPT, Gemini, Claude or Llama amongst others

Chart 9: AI use in the financial sector: applications and use cases (number of responses)

AI is currently used across various sectors for purposes such as marketing and product improvement, converting documents to text (optical character recognition – OCR), and the automation and optimisation of processes. The least frequently mentioned AI use cases are algorithmic trading, risk management and price optimisation.

As regards future implementation, respondents see high potential for AI to improve the customer experience that the financial institution offers, AML and fraud detection. They also see potential in monitoring and reporting.

The survey also included an open question enabling respondents to present other specific examples of AI use in their institutions. Respondents in each segment reported the following uses of AI:

Table 12

Specific areas in which respondents use AI in practice

Banking and payment services	Insurance and pensions
• creative work with text, extraction of data from invoices, summarizing of long documents • in AML and risk monitoring • to automate processes, e-mails and for security, including cybersecurity • to convert unstructured inputs into structured data • to operate a chatbot, to detect fraud, to prepare targeted offers, to analyse trends, to draft responses to clients and so on	• to develop applications • to prepare marketing materials for clients • for translations, to write text, information retrieval, presentations • to evaluate the results of screening the client portfolio for the list of persons subject to restrictive measures and the list of politically exposed persons
Capital markets	**Financial intermediation**
• as a helper for auxiliary activities • to research documents and for creative activities • Some are still evaluating the benefit that AI can bring to business	• text extraction, comparison, grammar checking • It has uses in cybersecurity

Generative AI is a significant area for analysis. In 2024, generative AI use was reported in all segments – banking and payment services (15), insurance and pensions (14), capital markets (7) and financial intermediation (6).

Specific examples of generative AI use are set out in the table below. In summary, many respondents report running pilot projects applying AI in various support and administration activities, the development of internal processes for generating text and documents, editing and making summaries, increasing productivity or streamlining activities.

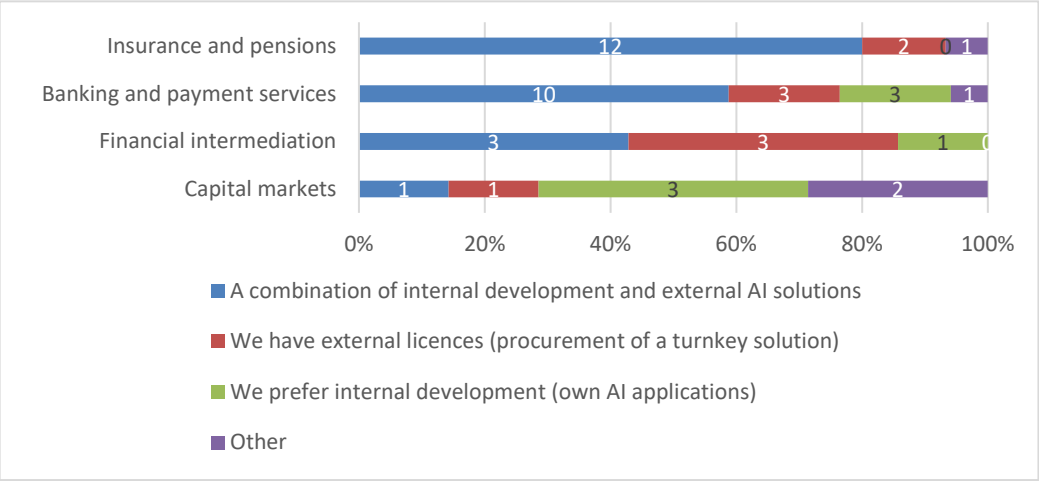
Table 13
Examples of generative AI use

Banking and payment services	Insurance and pensions
• Increasing productivity, developing applications • Development, internal testing, internal help desk • Microsoft Copilot 365, Azure OpenAI service, Custom ChatGPT Solution, generating software code, generating text • Generating text, designing software code	• Microsoft Copilot (MS), Microsoft Copilot (GitHUB) • We use ChatGPT to gather information, to prepare document summaries, to increase productivity and other routine tasks performed by internal staff • Azure OpenAI, Microsoft Copilot
Capital markets	**Financial intermediation**
• We use ChatGPT solely as a support assistant • Document summaries, text generation and editing, we are currently preparing for large-scale use to protect against the leakage of sensitive information • Assistance in producing text content, marketing materials, SEO and social networks	• Marketing texts, checking information, data retrieval, optimising scripts, administrative purposes • We use GitHUB, Microsoft Copilot to increase our developers' productivity and we are planning to test M365, Microsoft Copilot • We are currently using ChatGPT and Microsoft Copilot, Adobe Generative AI and we have local tests of Llama and Claude

The survey investigated both the purposes for which respondents use AI and the technical resources that underpin such uses.

Respondents most frequently reported that their AI use is powered by a combination of internal development and external solutions. This approach is well established in the banking and payment services sector (10) and the insurance and pensions sector (12). This combined approach may be effective as a short-term strategy but in the long term respondents may prefer internal development (e.g. to achieve lower costs and their own internal implementation of valuable use cases with an emphasis on internal security policies). For the time being, only a small minority of respondents exclusively prefer internal development (6.4%) or externally purchased licenses (also 6.4%).

Chart 10: Approaches to technical resources for AI



For a more in-depth analysis, the survey asked about respondents' personnel and procedural policies on AI, i.e. their internal governance frameworks. The responses show that AI use is currently restricted to certain employees within the institution. However, it is not typically restricted to a separate department.

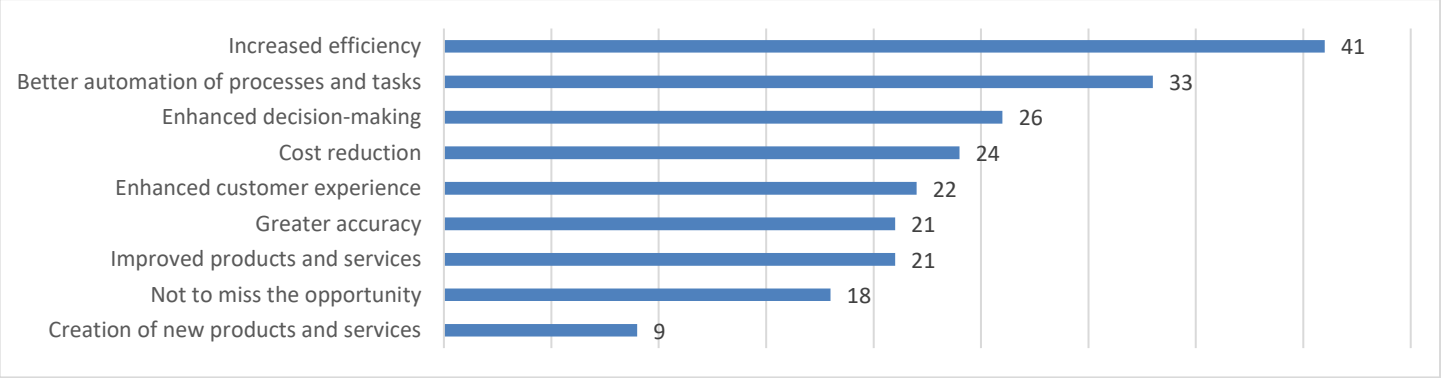
This trend stands out particularly in the banking and payment services sector (10) as well as the insurance and pensions sector (12).

The next most common trend is for all employees to have free access to applications. This is a significant approach in banking and payment services (7).

Certain respondents state that they have established a special internal policy to govern AI use (types of activities, data used, required licences etc.). They are found in the banking and payment services sector (5) and the insurance and pensions sector (6).

The benefits that the majority of respondents across all four sectors look for in AI are primarily higher efficiency and better automation of processes and tasks. These are followed by improved decision-making capacity, greater accuracy and cost savings. It is interesting that the trends in perception of benefits are very similar across different sectors.

Chart 11: Main benefits of using AI across the financial market (number of responses)



In the banking and payment services sector, the most frequently mentioned benefit of AI was increased efficiency in internal and external processes. This was followed by task automation and the elimination of repetitive activities. Others mentioned benefits such as reducing the impact of human error and greater automation of large IT systems.

Respondents also highlighted the significance of personalised communication with clients 24/7 made possible by AI chatbots and voice bots. Banks are leveraging AI to upgrade institutional operations and the accuracy of outputs. In addition, some see AI as a means to gain a better understanding of trends in IT security, risk management, customer experience and clients' requirements. AI can also enhance the quality of products and services to deliver a better customer experience.

In the insurance and pension sector, the primary benefit of AI is to increase process efficiency. Other benefits mentioned include improved configuration of digital online processes through mobile applications or the web and enhanced decision-making capabilities. AI helps to reduce costs and contributes to the automation of processes and tasks. This primarily concerns the elimination of repetitive manual tasks related to the processing and assessment of applications. Chatbots and voice bots are notable for being available 24/7 to provide clients with useful information on insurance options and claim procedures. It makes sense for respondents to be taking a cautious and systematic approach given the forthcoming regulatory framework. Respondents are focused on improving their products and services, e.g. for inspections of motor vehicles.

In the capital markets sector, interest is strongest in increasing efficiency and better automation of processes and tasks. After these benefits, respondents ranked cost reductions, improvements in the quality of products and services and improved decision-making abilities. The sector looks for both speed and higher added value in products and services compared to competitors. It is equally important for respondents to keep pace with modern trends.

In the financial intermediation sector, respondents showed most interest in AI's potential to increase efficiency and save time. Other significant benefits are the use of AI to eliminate errors and achieve higher accuracy. AI unequivocally helps in the automation of processes and tasks. Respondents hope to use AI to improve the customer experience, increase accuracy and reduce costs. The value added by AI would thus flow not only to respondents but also to their clients.

AI offers the potential for greater operational efficiency and higher quality services but the scope and tempo of implementation is linked to the institution's strategy.

All the respondents using AI (41.8%) are focusing on specific improvements in individual cases through AI tools rather than the mass deployment of the technology at any cost.

Open questions were used to elicit specific examples of AI use with regard to benefits, which are set out in the table below.

Table 14

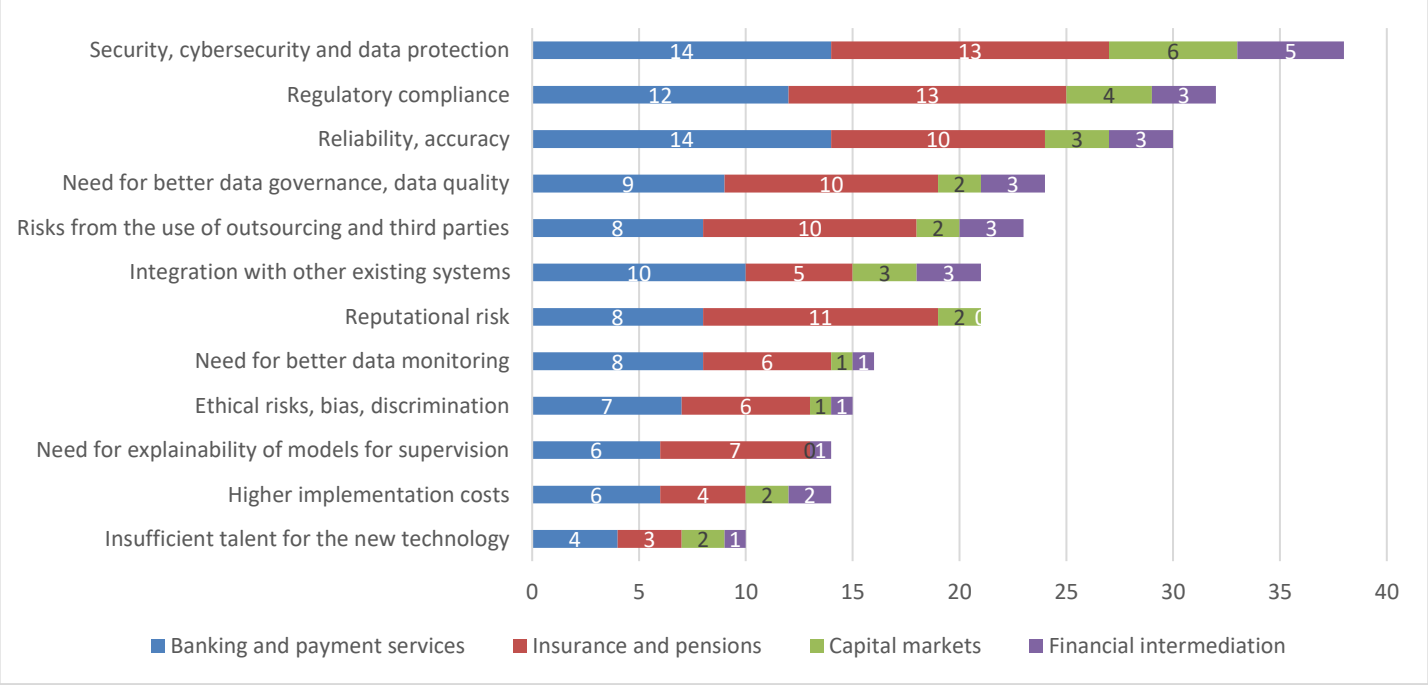
Main benefits of AI use in the financial market

Banking and payment services	Insurance and pensions
• The bank sees its main benefits in the elimination of the human factor, i.e. improvements in productivity, accuracy, responsiveness, decision-making, automation and real-time support 24/7 • AI reduces costs, increases accuracy, and improves the quality of products and services • AI tools can help with activities that can be processed by computer systems thereby opening up new opportunities.	• AI should expand the range of processes that can be automated and bring about enhancements in products and services • Increased productivity, voice bot for call centre, chatbot for communication with clients • AI provides more options for rapid processing and communication within the company
Capital markets	**Financial intermediation**
• Improved efficiency and cost savings • We expect AI to deliver more efficient processes, improved client services, a better customer experience, and higher revenues and profits • Faster retrieval of necessary data and information	• Accuracy, efficiency, simplified streamlined processes without errors • Improvements in accuracy and automation of document recognition and processing • AI will benefit us mainly in relation to our knowledge database and its management, analytical tools for data interpretation already save hours of work

AI brings not only advantages but also risks. We asked respondents what risks they perceive in AI use. Overall, respondents see the highest risks in the areas of security, cybersecurity and data protection (82.6% of AI users). This is followed by regulatory compliance (69.6%) and in third place, reliability and accuracy (65.2%).

Respondents' lower ranked concerns about AI risks were higher implementation costs (30.4%), the need for model interpretability for oversight (30.4%) and in last place a shortage of talent to work with the technology (21.7%).

Chart 12: Perception of risk in relation to AI implementation by sector (number of responses)



The highest levels of concern about AI risk were reported by the banking and payment services sector and the insurance and pensions sector. This may be due to the fact that these are also the sectors with the highest levels of AI adoption, at 65.4% and 51.7% respectively.

Open-ended questions were used to obtain further information on this issue. Respondents in banking and payment services mentioned various concerns about AI use. Some believed that there was a perception of very high risk relating to the mandatory protection of sensitive data, security and legal compliance. There were significant concerns about potential reputational risk and associated measures.

There were also concerns about the ability of employees to correctly assess what can and cannot be put into an AI tool like ChatGPT. Some see AI as an “opaque technology”. They think that it could be difficult to integrate with existing systems. Respondents expressed concern that if they do not implement the technology, it could jeopardise their position in the market. Some also mentioned the need for continuous human oversight over artificial Intelligence.

In the insurance and pensions sector, one of respondents key concerns was data breaches. In addition, respondents mentioned the risk of a careless AI implementation leading to cyber threats and weaknesses introduced through careless use or misuse of AI. Finally there were also concerns about failures to detect errors and general risks.

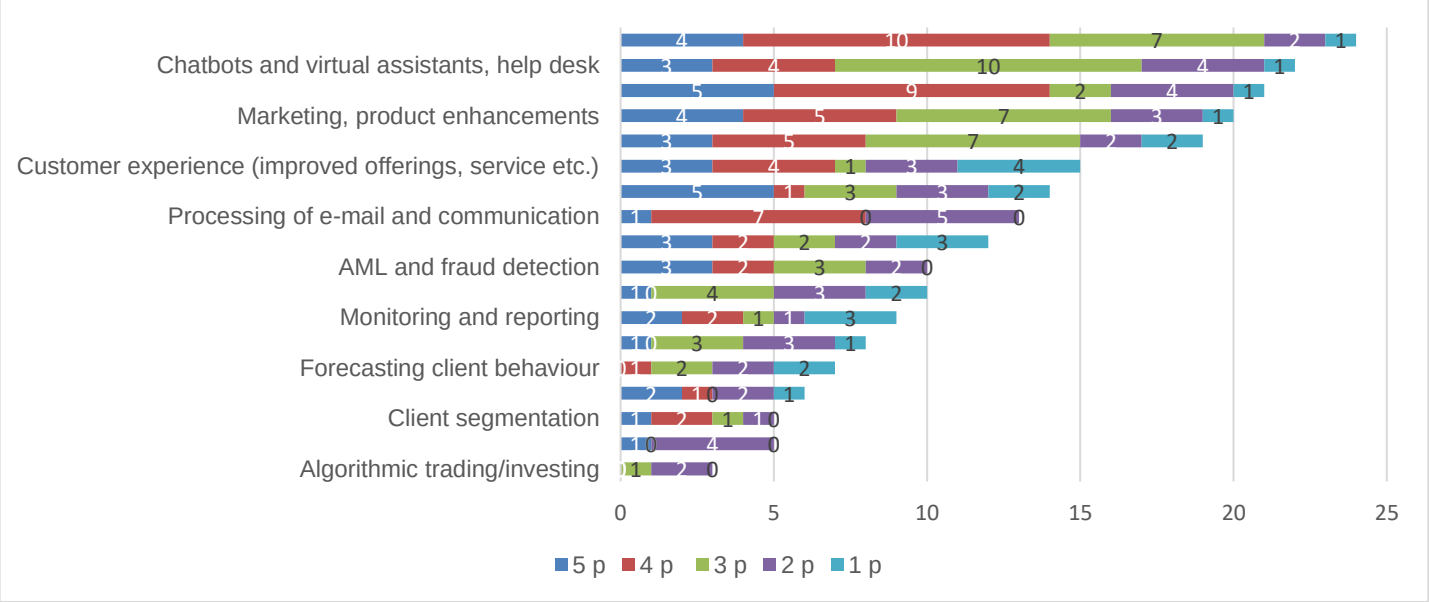
In the capital markets sector, the most frequently mentioned areas of concern were the exposure of confidential information and the risk of “hallucinations” in the technology causing it to output erroneous information.

Financial intermediation firms most often mentioned concerns about security breaches, limited accuracy and reliability and risks related to ethics, discrimination and safety. Respondents are concerned about data leakage, badly configured algorithms and phishing.

Levels of concern are relatively evenly distributed across sectors, which indicates that respondents have roughly the same perception of concerns and the related risks.

Besides risks, the survey inquired into the utility of AI implementation – in the sense of respondents’ subjective perception of its benefits – in relation to selected areas of potential application. Overall, respondents perceived the highest level of utility in using AI to automate and optimise processes. This was followed by virtual assistants and help-desk tools such as chatbots and text extraction (OCR). Conversely, respondents had so far found little utility in algorithmic trading, process optimisation or client segmentation. The responses on the perceived utility of AI are in some places very similar to the responses about the most frequent use cases for AI.

Chart 13: AI applications – utility (from 1 to 5, higher is better) (number of responses)



Respondents could also add information in response to an open-ended question but none of them gave a specific answer.

Data sensitivity is a very important issue not only in relation to AI. We were particularly interested in whether respondents perceive any limitations of if they have specific governance frameworks.

Respondents in the banking and payment services sector said that their institution was preparing an internal policy on AI but they did not use any sensitive client data in connection with AI. They operate in a limited extent. One respondent said that they already have an internal policy on AI use that governs its use within the institution (types of activities, data used, required licences etc.). Respondents also take care to ensure that data and information are handled in accordance with applicable legislation such as the GDPR.

Some respondents in the insurance and pensions sector said that they are currently working on an AI governance framework jointly on the group level. There are also other respondents who have restricted AI use to internally defined data and models that do not involve sensitive data. A few respondents had even issued internal guidelines on AI use. These highlight the prohibition on entering and processing sensitive and confidential information and personal data. Other respondents have implemented technical restrictions on access to internal resources from the external environment. Several respondents process data in a manner restricted by the provisions of their data governance framework. There are even a few respondents with a very conservative approach to AI.

In the capital markets sector, respondents stated that they have rules on the confidentiality of corporate information. At present, AI is used only for information that is not classified as sensitive.

In the financial intermediation sector, no internal data are entered into AI software and the respondents intentionally anonymise data. They are preparing internal guidelines on AI.

After data sensitivity and internal policies, the survey asked about how respondents use "high-risk systems" as defined in the AI Act. High-risk AI systems are defined in Annex III of the Artificial Intelligence Act. We were curious whether respondents are already using these kinds of systems in our financial market.

Table 15

High-risk AI systems

High-risk artificial intelligence systems are AI deployments that may pose a significant risk to the health, safety or fundamental rights of natural persons.

High risk AI systems are therefore subject to stringent pre-market obligations such as ensuring the implementation of adequate risk assessment and mitigation systems, activity tracking ensuring the traceability of results and adequate measures in relation to human oversight, amongst others.

Examples of high-risk AI systems:

- AI systems used to provide access to essential public and private services (e.g. to establish a credit score determining whether or not a person can receive a loan);
- AI systems intended to be used for risk assessment and pricing in relation to natural persons in the case of life and health insurance;
- AI systems intended to be used for partial automation of the recruitment of employees, to manage workers and self-employed contractors (e.g. software for assessing CVs in a recruitment process);

Our findings showed that none of the respondents were currently operating any high-risk AI systems. Furthermore, 89.1% of respondents who had implemented AI said that they neither operated such systems nor planned to introduce them in future. On the other hand, one respondent plans to be using such systems within one year and four respondents envisage their use in future though not within the next three years. One respondent in the banking and payment services sector said that they were working on adapting existing models to comply with the AI Act.

Table 16

Other AI surveys

National supervisory authorities are increasing their investigations into AI. AI is an innovative technology and a trend that attracts considerable interest in the public and private sectors. AI has already demonstrated that it offers significant benefits in areas such as automation, faster operational processes, greater accuracy and the elimination of errors caused by the human factor. On the other hand, AI can also bring risks, especially if it is implemented incorrectly, non-transparently, with potential negative impacts on the users of AI systems and their products and services.

Several European supervisory authorities have recently conducted surveys of supervised market undertakings to analyse AI use in the financial sector. Similar research has been conducted by, for example, the Financial Conduct Authority (UK), the Finansinspektionen (SE), and the Commission de Surveillance du Secteur Financier (LU).

What were their findings and how did they compare with ours in Slovakia? In general, they identified similar trends in the way market players perceive the benefits and risks of AI:

Main benefits: greater efficiency, productivity, lower costs, optimisation of internal processes, automation, better customer support, higher security, better summarisation of text and documents, simpler data retrieval

Risks: data protection, data quality, privacy protection, ethics and reputational risk, need for better AI monitoring, reliability and accuracy

Differences: the level of uptake of AI is much higher in SE (84% of respondents) and the UK (75% of respondents) than in Slovakia (41%). As many as 83% of Swedish respondents said that their employees could use AI for common work tasks – translations, text generation, programming (generative AI) whereas the value for Slovakia should be 91% (46 respondents use AI, of which 42 use generative AI systems).

As regards governance, 84% of UK respondents/firms have in place their own AI governance framework whereas in Sweden, 32% of respondents have put in place AI policies. On the other hand, 20% of entities have prepared policies on generative AI and 32% are still working on an AI framework. In Slovakia, only a bare minimum of respondents have developed their own AI governance framework. At the same time, AI has already become a popular assistant.

In other countries, AI adoption is strongest in the banking sector and Slovakia shows a similar situation.

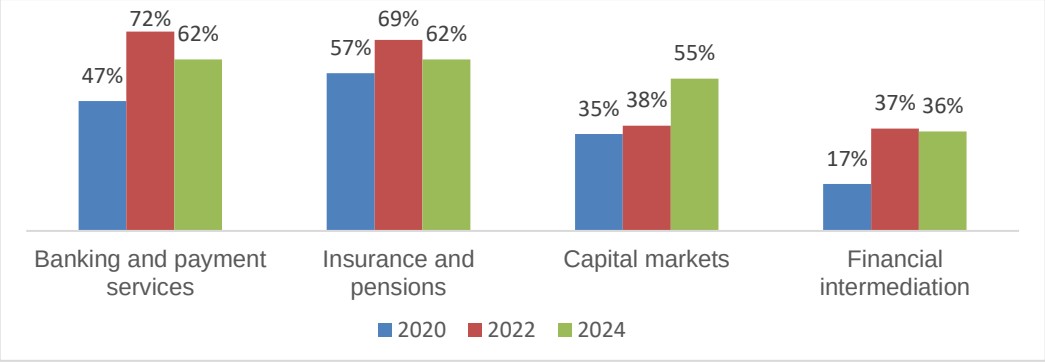
We would like to conclude by noting that the UK authorities conduct a survey of AI issues every two years. Their results show that AI use has grown significantly, literally in leaps and bounds of tens of percentage points upwards.

5. Online onboarding, mobile applications, RegTech

We once again dedicated several questions to online onboarding technologies and especially remote client identification. The survey focused on several aspects of this such as the procedures used for remote client identification and the level of adoption of mobile apps by new clients.

A specific question was dedicated to the range of products and services that respondents offer to clients via mobile apps. An important question was dedicated to use of RegTech, regulatory technology, to improve processes related to regulatory compliance and prescriptive requirements in the financial sector.

Chart 14: Availability of online onboarding in the financial sector



We began by asking whether clients are able to open accounts remotely. In our market, this option is offered mainly by respondents in banking and payment services (16) insurance and pensions (18) and capital markets (18). The sector with the lowest availability of remote account opening is financial intermediation (8).

Undertakings that do not offer online onboarding have their strongest representation in the financial intermediation sector. The reason why online onboarding has taken off so little in financial intermediation is that the sector's business is based on personal contact with clients.

Looking at changes over time, the development of online onboarding has ground to a halt in the banking and payment services sector and the insurance and pensions sector. On the other hand, it continues to grow in the capital markets sector and the financial intermediation sector. These results may however be distorted by differences in the sample of respondents from survey to survey. When the financial market is considered as a whole, significant growth can be observed in the use of online onboarding. In 2020, less than 40% of respondents offered online onboarding, which has risen to over 54% in 2024. There is still room for this number to grow because there are still market players, especially in the capital markets sector and financial intermediation, who are planning to implement online onboarding in the future.

Online onboarding makes it possible to establish first contact with a client without the need for a physical visit to the financial institution. This raises the interesting question of what percentage of respondents' new clients begin using their products or services without visiting their premises in person.

In the past year, more than 40% of new clients used remote products and services from the banking and payment services sector (6), insurance and pensions (2), capital markets (10) and financial intermediation (2).

Conversely, the sector where new clients made least use of such possibilities was financial intermediation, which may be related to the fact that this option is simply not available.

The survey results show that the sector with the most respondents whose products and services are used without a visit to a place of business by over 80% of new clients is the capital markets sector (27.3%). This finding is interesting because it points to the relatively high popularity of web and mobile apps for investment. It may reflect the emergence of a younger generation of investors who wish to place orders and instructions intuitively based on their own needs.

An open question invited respondents to give specific examples of remote client identification:

Table 17

Method of implementation and form of remote client identification

Banking and payment services	Insurance and pensions
• Facial biometrics, scan of identity card, verification • Verification by e-mail, SMS and phone number, through the database of the Ministry of Interior, photo of identity card • Application, scanned documents, video call	• Multi-level identification • Online communication, facial biometrics • Comparison with the database of the Ministry of Interior • Printing and signing a form, send it back in paper form or by e-mail
Capital markets	**Financial intermediation**
• Biometrics • Facial biometrics, scan of identity document, verification in registers • Electronic signing of documents using the national identity card (electronic services of the Ministry of Interior)	• We use facial biometrics (comparison of a selfie with the photo on the identity card), check of data extracted from the identity card using the Ministry of Interior API • By means of an identity document displayed on camera or additional biometric verification on the partner's side • By e-mail and SMS notifications for selected products

The responses show that there are multiple methods for remote client verification in the financial market. Respondents most frequently mention multi-factor verification of identity documents, e.g. comparison of scanned documents with the Ministry of Interior database, and other forms of multi-factor authentication. This type of identity verification can use e-mail, SMS or the transfer of a small sum from the client's account.

The methods used to identify clients are fairly similar across sectors. Despite the widespread use of online onboarding, it is clear that clients still need to visit a branch in person for certain purposes (e.g. the transfer of larger sums of money to reduce AML risk, changes of personal data, changes to existing contract, more complicated products, such as mortgage loans, etc.).

The results show that at present 38.2% of respondents offer a mobile app, mainly the banking and payment services sector (16) followed by capital markets (10), insurance and pensions (9) and financial intermediation (7).

Conversely, the sectors with the largest share of respondents who have no plan to launch a mobile app either now or in the future are the insurance and pensions sector (34.5%) and the capital markets sector (8.2%). In the financial intermediation sector the holdouts make up just 4.5% of respondents. These are relatively small numbers. The small number of holdouts against mobile apps shows that remote access and the initial process – online onboarding, which is frequently

carried out through a mobile app on a phone or tablet, are more or less a necessity in today's environment to facilitate interactions with clients.

Just 10.9% of respondents said that they provide full access to products and services through their mobile app. This is not a surprising finding in the context of potential security risks. This issue especially concerns respondents in the banking and payment services sector (5). The following table shows the specific scope of products and services that individual respondents do not provide through their mobile apps:

Table 18

Scope of products and services that respondents do not make available through their mobile apps

Banking and payment services	Insurance and pensions
• Establishment of mortgage loans, term deposits, trading on the stock exchange • Bulk payments, signing of contractual documentation • Security restrictions, infrequent actions	• No access to a selected group of insurance products, execution of selected changes to insurance, settlement of motor vehicle insurance claims • Personal data • Actions that are extremely complex
Capital markets	**Financial intermediation**
• Service operations, request for the issue or redemption of units • Changes of personal data • Acceptance and transfer of an instruction, conclusion of a new contract	• Records of selected concluded contracts • Own contracts, claims, reports • Overview of concluded contracts

The responses show that the range of products and services available through the mobile app is relatively broad across all sectors. On the other hand, respondents withhold certain functionalities of products and services for both practical and safety reasons (e.g. infrequent operations, complicated products and services). It is the same in the case of access to a trading platform.

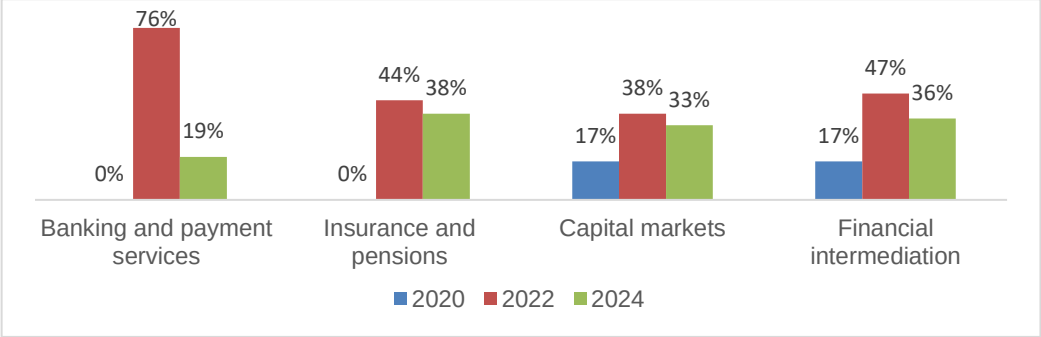
A high level of mobile app adoption (use by over 80% of new clients in the last year) stands out among clients of the banking and payment services sector. These high levels of use are observed mainly for larger companies and use cases where speed of operations is important to clients such as initiating payments, checking balances or placing online investment orders.

The smaller the market participant, the less likely they are to offer a mobile app. Most now offer a web interface, which is enough for them.

RegTech (regulatory technology) tools are most commonly used by respondents that have implemented solutions for reporting and disclosure in relation to the national regulator. Adoption of RegTech currently lags behind more widespread technologies like mobile apps and cloud services. It is nevertheless an important tool with the potential to significantly boost the efficiency of processes related to regulatory compliance, internal compliance and interactions with supervisory authorities. Developments in this area could contribute to the automation of rule enforcement, real-time transaction monitoring and a decrease in regulatory burdens through the digital transformation of oversight (combined with "SupTech" tools on the side of the supervisory authorities).

The present survey also included a question on the extent to which respondents use RegTech in fulfilling their obligations as supervised entities.

Chart 15: Use of RegTech tools over time



Overall, the use of RegTech tools fluctuates over time. There has been a steep decline in their use in the banking and payment services sector but a similar movement can also be seen in other sectors, especially when comparing the years 2022 and 2024.

RegTech tools are currently most used in banking and payment services (5), followed by insurance and pensions (11), capital markets (11) and financial intermediation (8).

Looking towards potential future use, there is the strongest appetite in the banking and payment services sector (50%), followed by capital markets (48.5%), financial intermediation (36.4%) and insurance and pensions (34.5%).

Table 19

Examples of RegTech tool use in different sectors of the financial market

Banking and payment services	Insurance and pensions
• Automated checking of clients against lists, information retrieval using the internet • Cloud Computing and AI • Machine learning in transaction monitoring	• Automatic checking of clients against lists in the production system when concluding insurance contracts and paying out insurance claims, application • Automated system for checking clients against sanctions lists • Use of public databases for identity verification
Capital markets	**Financial intermediation**
• Identification and verification of client documentation, face and life verification – biometrics, basic AML screening (politically exposed persons, ultimate beneficial owner (UBO), sanctions lists) • Rest API FinStat, SOPEO	• Automation of AML processes for legislative compliance and risk management, AML screening, sanctions lists, ultimate beneficial owners

6. Distributed Ledger Technology (DLT), smart contracts, and cryptoassets

Distributed ledger technologies (DLT), smart contracts and cryptoassets are innovative solutions that continue to receive growing attention in the financial and non-financial sectors. Their potential ranges from the development of new financial products and decentralised platforms to the creation of digital assets and the automation of contractual relationships.

While the previous survey found two respondents using DLT, none of the participants in the present survey were using such technologies. Interest in implementation suggests there is still potential for growth – one respondent in the capital markets sector said that they plan to deploy DLT within 1 year. Another 14 respondents plan to implement DLT within a timeframe of one year or more, mainly in banking and payment services (5) and insurance and pensions (4). Such ambitions were also reported by 3 capital market undertakings and 2 financial intermediation companies. The respondents did not indicate what use cases they had in mind.

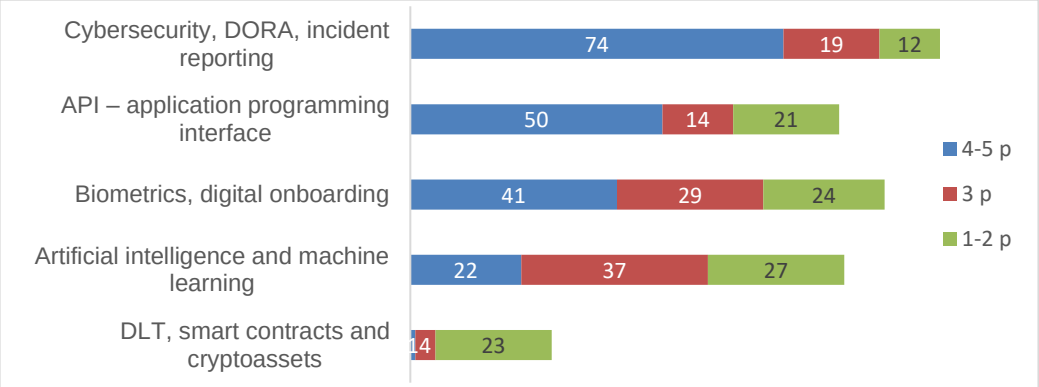
The landscape in the use of cryptoassets showed no significant change compared to two years ago.

The adoption of the MiCA regulation, which took full effect on 30 December 2024, provides a clear regulatory framework for the future development of the cryptoasset ecosystem in Slovakia. Three respondents have already confirmed their intention to provide cryptoasset services within the next three years, indicating the beginning of the gradual integration of these innovative technologies into the Slovak financial sector. It is important to emphasise that the survey covers only existing supervised entities and does not include potential applicants for licences under the MiCA regulation, who were able to operate outside the supervised financial sector until 30 December 2024.

7. Digital challenges

The final section of the survey invited respondents to reflect on their approach to individual technologies in their internal strategies. In this context, 'internal strategies' means priorities, plans, budgets and the importance placed on a topic in the present and in the future. Respondents were asked to assess how important certain areas were for them using a scale from 0 to 5 (a higher score being more important).

Chart 16: Relevance of technologies for respondents' strategies (number of responses)



Overall, respondents see cybersecurity, DORA and incident reporting as the most important of the studied areas. As many as 67.3% of respondents assigned these areas a score of 4 or 5. This may be related to the DORA regulation beginning to take effect in the EU on 17 January 2025. This trend may also be related to the focus on security that has been prompted by the rise in cyberattacks during the COVID pandemic and recent geopolitical events. The rise of generative AI has also led to an increase in cyberthreats.

The second most important area for respondents in the present survey was APIs – application programming interfaces, which are relevant to the PSD2 and FiDA regulations. This area was given the highest or second highest score by 45.5% of respondents. API development plays a key role in many current issues. One is the FiDA regulation, which establishes an "open finance" framework. In the modern world, financial institutions collaborate and communicate through secure, standardise channels that need to be standardised, regulated and supervised. Once again, this is an area that may be strategically important for market participants as well as reflecting impending regulation.

In third place, respondents placed biometrics and digital onboarding. Across all sectors, 37.3% gave this topic 4 or 5 points. Biometrics and online onboarding are now fairly widespread technologies and they are useful as financial undertakings look to reduce their numbers of branches. The trend can be observed in other EU countries and the technology is becoming standardised on the national level (for example, it is relatively common for identity documents to be checked against the Ministry of Interior's database in Slovakia).

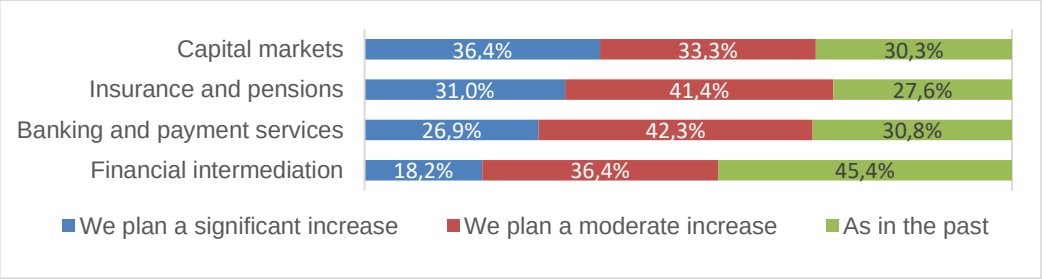
Respondents also assign medium (or higher) importance to the area of artificial intelligence, which may indicate that they recognise its importance and plan to use it more intensively in the near future (53.6%).

In the present survey, the least relevant area for respondents' strategies is the area of DLT, smart contracts and cryptoassets. The low relevance score may be related to the smaller number of use

cases that the Slovak market currently offers in this area. The new MiCA regulation and the DLT pilot regime[9] may change the priority of this area over time.

The strategic significance of security was studied in more detail by a question about increased spending on security.

Chart 17: Increased spending on cybersecurity in 2024



Overall, 29.1% of respondents plan to increase their expenditure on cybersecurity by a significant amount, especially respondents in banking and payment services (7) but also in insurance and pensions (9), capital markets (12) and financial intermediation (4).

A similar number of respondents, around a third of the market, said that they planned only a moderate increase in their spending on cybersecurity or that they had no plans to spend more.

An open-ended follow-up to this question was used to gather more information on the specific areas in which respondents planned to increase expenditure. A large majority of respondents aim to enhance security against external threats, protect client data, improve system security and focus on regulatory compliance (especially the DORA regulation and the NIS2 directive). These activities are also evenly represented across all sectors.

Table 20

Examples of increased cybersecurity expenditure

Banking and payment services	Insurance and pensions
• System updates, network components, cybersecurity testing, DORA implementation, training on DORA • Fraud prevention • Regulatory compliance and AI	• DORA • Incident evaluation and prevention using AI, cloud solutions • Training, ransom protection, testing
Capital markets	**Financial intermediation**
• DORA compliance • Improvements in cybersecurity and its automation, testing, protection, tests, resilience • Data protection, backup, security, data sharing and access (cloud solutions), data access (internal/external, audits)	• Enhanced security, primarily against external threats • Penetration testing, implementation of two-factor authentication across all services and systems, in-dept server and database encryption, training • NIS2/DORA compliance, ISO27001, configuration of cybersecurity processes, planned security audits

The last question for respondents was open-ended. It asked what changes in legislation or activities of NBS or other public institutions would assist them in effectively implementing innovations.

Table 21

Suggestions and ideas for improvement for NBS and the public sector

Banking and payment services	Insurance and pension saving
• It would be helpful if NBS and the public sector published statements on modern technological trends, including AI • Standardisation of content and forms for data exchange between institutions • A regulation on signing documents through publicly available mobile technologies • Organisation of workshops, seminars and consultation focussing on the presentation of innovative trends and discussion on implementation with NBS experts	• A stable legislative environment, sufficient time for the implementation of legislative changes and regulations • Setting rules and providing access to state registers for remote identification • Seminars and methodological guidance on AI regulation, or alternatively the organisation of expert seminars • Facilitating electronic service communication between legal entities through the assigned eGov mailbox
Capital markets	**Financial intermediation**

[9] Directive (EU) 2022/858 of the European Parliament and of the Council of 30 May 2022 on a pilot regime for market infra-structures based on distributed ledger technology.

• Guidelines, forms and procedures for the DORA regulation • More specific guidance on the implementation of European rules and reporting. • Regular seminars, conferences and meetings with the market where new regulations and the activities of the ESMA, EBA etc. are presented in comprehensible format • Equalisation of the tax regime for different investment assets to avoid disadvantaging investments and loans to local/domestic companies	• More time to prepare when legislation changes, more opportunities for consultations before and after planned changes • NBS should provide training on new mandatory reports and disclosures, including their structure • Greater flexibility in NBS's implementation of legislation for solutions

In summary, respondents mentioned several areas where they see room for improvement in the public sector's approach to financial technologies and innovations. Overall, the most important areas for respondents were the need for clearer guidelines, methodologies and regulations from Národná banka Slovenska and the public sector in general, including ministries, associations and the like.

Across all sectors, respondents call for the organisation of workshops, seminars and training to support, guide and assist the implementation of new technologies such as AI. Opinions, formulations, simplified reporting and a better approach to legislative amendments could also serve as effective means to increase the satisfaction of market participants.

Conclusion

The 2024 survey of innovation in supervised entities illustrated both the current situation and likely future trends in the technological transformation of the Slovak financial sector. The results show that the financial sector is successfully absorbing digital innovations even though significant differences exist between large institutions with international connections and smaller local businesses.

The technological priorities of 2024 are clearly apparent – cybersecurity (a high priority for 67.3% of respondents) and API use have a leading position in strategic plans. Cloud services, with overall adoption at 79.7%, and digital onboarding, with a 62% implementation rate, are becoming standard parts of the technical infrastructure of finance.

Artificial intelligence is growing in significance as it enters a new phase in its development. Despite the fact that it has been implemented in 41.8% of institutions, of which 91.3% use its most modern, "generative", form, deployment remains fragmentary to a significant extent and there is a lack of coordinated strategies. The absence of a systematic approach is a major barrier to the full leveraging of its transformational potential.

The survey identified three key challenges that require attention: Firstly, while 46.3% of institutions (mainly larger participants) innovate systematically on both the international and local levels, 27.3% of respondents (mainly smaller participants) are entirely dependent on limited local solutions, which exacerbates the digital divide in the market. Secondly, respondents see the regulatory requirements of DORA, NIS2 and the AI Act primarily as a cost burden and do not see the strategic potential of such legislation as an opportunity to build a competitive advantage through enhanced security. Thirdly, despite the widespread adoption of AI, institutions have not yet put in place a systematic approach to implementation – only a fraction have dedicated AI teams or a formal strategy for managing AI risks.

Addressing these issues requires more intensive cooperation within the ecosystem – between the relevant ministries as legislative authorities, the NBS as the supervisory authority, the supervised entities and technology providers. Building capacity in the field of financial technologies, especially for smaller entities, will help to bridge the identified digital divide.

The survey results show that the Slovak financial sector is well-prepared for future challenges. An integrated approach to innovation based on effective collaboration and continuous dialogue between stakeholders is critical for unlocking the full potential of financial technologies in Slovakia. NBS will continue to support innovative activities through its Innovation Hub, Regulatory Sandbox and other initiatives for the sustainable development of financial technologies in accordance with the principles of prudence, financial stability and consumer protection.