

## Innovative approaches to financial and legal regulation of insurance products in the InsurTech era

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**Abstract.** The article was aimed at studying legal peculiarities and identifying topical problems of regulation of innovative insurance products operating with the use of InsurTech technologies. The study applied the comparative legal method to compare the norms of Kazakh and international legislation in the field of insurance. Formal-legal and systemic approaches were used to analyse the structure and content of legal acts regulating InsurTech products. The legal modelling method made it possible to substantiate the prospects for the development of financial and legal regulation taking into account the digital transformation of the insurance market. The study analysed in detail the essence of InsurTech as the integration of digital technologies into the insurance industry, which identified key areas of industry transformation, including smart contracts, automated risk assessment and personalised digital products. A study of the current state of legal regulation of insurance activities in the Republic of Kazakhstan revealed a number of gaps, in particular, the lack of normative consolidation of concepts related to digital insurance services, as well as insufficient flexibility of legal mechanisms to respond to technological changes. As a result of the analysis of international experience, it was found that the EU and the US have introduced specialised regulatory regimes, such as “regulatory sandboxes”, which allow testing digital insurance products under controlled conditions with minimal regulatory burden. Mechanisms such as the FinTech Regulatory Sandbox and InsurTech Innovation Hub have been considered to provide regulatory flexibility while maintaining an appropriate level of consumer protection. The analysis showed that such initiatives facilitate the accelerated integration of innovations into the insurance sector and can be adapted to the Kazakh context, taking into account local legal and institutional peculiarities. Based on the comparative analysis, recommendations for Kazakhstan were proposed, including the development of legal definitions, expanding the functionality of the financial supervisory agency in terms of InsurTech, as well as the introduction of a legal mechanism of “regulatory sandbox” in order to stimulate innovation while respecting the requirements of legal certainty and consumer protection

**Keywords:** insurance law; digital technologies; artificial intelligence; blockchain technologies; automated risk assessment systems; digital identification

### Introduction

The digitalisation of the financial sector is becoming systemic, affecting not only banking services but also insurance. The development of InsurTech, an innovative segment based

on the application of digital technologies in the insurance industry, is transforming both the product line and the mechanisms of interaction between insurers, consumers and the

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state. With the active introduction of artificial intelligence (AI), blockchain technologies, automated risk assessment and digital identification systems, there is a qualitative shift in the structure of the insurance market. The traditional insurance model is being changed by moving to more technological, flexible and customer-oriented forms of providing insurance services (Kuzmak & Svereda, 2023). These changes create both new opportunities for increasing accessibility and personalisation of insurance services and legal challenges related to the protection of personal data, ensuring transparency of algorithmic decision-making, regulation of digital intermediaries and preserving the legal balance between innovation and stability of the financial system. For the Republic of Kazakhstan, which is at the stage of forming an adaptive model of financial regulation, it is particularly important to rethink the existing legal mechanisms in order to adequately respond to the dynamics of the InsurTech market and to comply with international trends in the regulation of digital insurance.

In the context of the rapid development of InsurTech and the digital transformation of financial services, research interest in the legal regulation of insurance products has increased significantly. However, the analysis of scientific sources demonstrates that despite the existence of some fundamental and applied developments, there are a number of unrevealed or insufficiently covered aspects. Thus, E.K. Akhmetov and M.Zh. Kulikpaeva (2022), studying the mechanisms of state regulation of the financial market in Kazakhstan, emphasised the imperfection of the existing supervisory practices and fragmentation of the legislative framework. Their work emphasises that the insurance sector, especially in terms of digital products, requires more flexible and adaptive forms of regulation that can respond quickly to technological change.

The United Kingdom experience analysed in the study by L. Fahy (2021), which focuses on the regulatory sandbox mechanism. The author demonstrates that the involvement of stakeholders in the process of regulatory experimentation increases trust in institutions, but the question of transferring these practices to jurisdictions with different institutional conditions remains open. K. Heinonen and T. Strandvik (2021) interpret the COVID-19 pandemic as a trigger for forced innovation in services, including insurance. The authors stressed the need to reconsider the traditional approach to innovation: in a crisis, the market requires not only technical, but also organisational and legal transformations that can support the adaptation of insurance services. M.Z. Kenzhaliev (2023) carried out a comparative analysis of the regulatory framework for Islamic finance in Kazakhstan, the United Kingdom and the International Financial Centre “Astana”. His results demonstrate that flexible multi-level regulatory models based on international practice promote the development of niche insurance products, including *takaful*, thereby highlighting the need for legal unification in the digital environment.

In their turn, R. Nagayev and N. Stambakiyev (2022), examining the current state of the Islamic finance industry in Kazakhstan, concluded that the lack of comprehensive legal mechanisms hinders the introduction of innovations, despite the high potential of the market. This highlights the need to develop flexible regulatory designs for InsurTech products that are religiously and culturally appropriate. L. Lin and C. Chen (2020) examined InsurTech as a twofold

phenomenon – on the one hand a source of progress and on the other a challenge to legal stability. Their critical analysis shows that technological innovations often outpace the regulatory framework, creating legal lacunas and increasing risks for consumers, requiring prior legal adaptation and coordination between regulators. Digital transformation of insurance has also been raised in the study by Z. Poorhadi Poshtiri *et al.* (2024), which proposes an insurance coverage model specifically designed for fintech start-ups. The authors emphasise the need for legal support for the digital footprint of start-ups, as traditional regulatory schemes prove inapplicable in flexible and unstable ecosystems.

The practical aspect of analysing the financial risks of insurance companies is disclosed in the work by B. Saparova *et al.* (2021). The authors, using an empirical approach, demonstrate the high exposure of the insurance sector to instability under conditions of insufficient regulatory support, especially in the process of digitalisation, which underlines the need for more dynamic legal support. A. Urbinati *et al.* (2020) examined the role of digital technologies in the process of open innovation. Using multiple case studies, they showed that digitalisation stimulates inter-organisational collaboration and accelerates innovation processes, but the effectiveness of these transformations depends on a regulatory environment that ensures legal security and predictability. Finally, A. Zhusupov *et al.* (2025) analysed theoretical aspects of the legal regulation of the state’s financial activity, focusing on the need to rethink public-law functions in the digital economy. Their argumentation confirms that the transformation of insurance regulation should be based on a systemic rather than fragmentary approach.

Thus, the conducted literature review demonstrates the presence of significant scientific interest in certain aspects of financial and legal regulation of insurance in the digital era. However, the lack of integrated approaches to analysing the interaction of InsurTech, legal risks and adaptation mechanisms indicates a scientific gap, the elimination of which requires a comprehensive theoretical and applied analysis. The aim of the article was to identify the legal features and problematic aspects of regulating innovative insurance products based on InsurTech technologies. To achieve this goal the following tasks were set: to analyse the essence and features of InsurTech as a phenomenon in the context of insurance and digital technologies; to consider the current state of legal regulation of insurance activities in the Republic of Kazakhstan in the context of InsurTech; to study the international experience of regulation of digital insurance services and determine the possibilities of its adaptation to the Kazakh legal system.

## Materials and methods

In the course of the work, a combination of general scientific and special legal methods was used, which provided a comprehensive approach to the assessment of the regulatory and legal framework for the functioning of digital insurance products and tools for their legal adaptation. The method of legal hermeneutics was used to analyse the terminological apparatus of the research. It made it possible to perform a lexical and semantic analysis of the concept of InsurTech in the legal context, trace its etymological origin as a combination of the terms insurance and technology, as well as identify the substantive characteristics formed in doctrinal sources and international practice.

The key research method was comparative legal analysis, which was used to compare the peculiarities of InsurTech and digital insurance regulation in the Republic of Kazakhstan with international experience of legal impact on digital insurance services. Within the framework of this approach, the norms of Kazakh legislation and international documents regulating the digital transformation of insurance services were considered. The following regulatory acts formed the basis of the Kazakh legal block of the study: Civil Code of the Republic of Kazakhstan (1999), Law of the Republic of Kazakhstan No. 126-II “On Insurance Activity” (2000), Law of the Republic of Kazakhstan No. 474-II “On State Regulation, Control and Supervision of the Financial Market and Financial Organizations” (2003), Law of the Republic of Kazakhstan No. 94-V “On Personal Data and Their Protection” (2013), Law of the Republic of Kazakhstan No. 2155 “On the National Bank of the Republic of Kazakhstan” (1995). A statistical method was used to study the quantitative characteristics of digital insurance development. The analysis covered the dynamics of conclusion of electronic insurance contracts in 2023, as well as the share of InsurTech products in the insurance portfolios of companies. Empirical data were obtained from the report of the Agency of the Republic of Kazakhstan on Regulation and Development of Financial Market (2024), data of the European Insurance and Occupational Pensions Authority (2024).

The formal-legal method was used to analyse the structure and content of existing regulations governing the specifics of the legal status of digital insurance products, the procedure for their remote registration, the protection of personal data, and the legal registration of electronic document flow between participants in the insurance process. To study the international experience of InsurTech regulation, official sources and analytical materials reflecting current initiatives in countries with developed digital financial infrastructure were used. Such resources as the Digital Regulation Cooperation Forum, InsurTech Innovation Hub, as well as regulatory and policy documents, including the Digital Finance Package (European Commission, 2020), Digital Operational Resilience Act (2025), and Fintech Laws and Regulations Hong Kong 2024-2025 (2024), were analysed as a basis for the study. These sources provided an overview of current trends and approaches to digital regulation in the EU, United Kingdom, US, Singapore and Hong Kong jurisdictions.

## Results

**Theoretical and legal foundations of InsurTech and insurance regulation.** InsurTech is a synthesis of the words “insurance” and “technology” and refers to the use of digital technologies and innovative solutions in the insurance sector. From a theoretical and legal perspective, InsurTech is considered as a set of digital platforms, algorithms and technological solutions aimed at optimising insurance operations, personalising insurance products, automating risk assessment and loss adjustment (Anagnostopoulos, 2018). The functioning of InsurTech is based on technologies such as AI, Big Data, blockchain, Internet of Things (IoT), smart contracts and cloud computing, which allow transforming traditional insurance models and rethinking them from a legal regulatory perspective.

From a legal perspective, the introduction of InsurTech entails the need to adapt existing insurance and financial regulations to the new digital realities. Thus, traditional legal categories such as insurance contract, insured event, and subject of insurance acquire new interpretations in the digital context (Permatasari *et al.*, 2025). For example, insurance contracts can be concluded remotely through digital platforms such as Lemonade, ZhongAn, which use automated AI-based risk assessment algorithms. Insurance claims are also settled using smart systems, such as the Tractable platform, which analyses photos of vehicle damage and automatically generates payment offers. These technologies minimise human involvement in insurance operations, but at the same time, they raise the need for regulatory liability for the actions of algorithms, as well as legal recognition of the digital form of contracting and information storage. This necessitates normative fixation of responsibility for the actions of algorithms, as well as legal recognition of the digital form of contracting and information storage.

Given the variety of digital solutions used in the insurance industry, it is necessary to identify the key technologies that form the basis of InsurTech and analyse their functional features from the point of view of legal regulation. This approach will help systematise the legal challenges arising from their introduction and outline areas for improving the regulatory framework. To this end, it seems appropriate to summarise the relevant aspects in the form of Table 1.

**Table 1.** Analysing key InsurTech technologies, their functions and legal challenges

Technology	Functional purpose in insurance	Legal challenges	Areas of legal regulation
AI	Automation of risk assessment, pricing, fraud detection	Non-transparency of algorithms, possibility of discrimination, issue of legal liability	Establishing transparency standards, defining the boundaries of automation, legal status of AI solutions
Big Data	Customer behaviour analysis, policy personalisation, insurance event forecasting	Breach of confidentiality, data collection without consent, risks of discrimination	Tightening regulation of data processing, informed consent requirements, access controls
Blockchain	Secure data storage, transaction verification, fraud control	Difficulties in error correction, cross-border data transfer, lack of legal certainty	Recognising the legal validity of records, ensuring compatibility with national data laws
IoT	Real-time monitoring of insurance objects condition, dynamic insurance	Threat of data leakage, liability for device failures, cybersecurity issues	Liability regulation, security standards, device certification
Smart contracts	Automatic fulfilment of insurance contract terms and conditions	Lack of flexibility, difficulty in interpretation, inability to make changes	Recognition of legal status, development of termination and dispute resolution procedures

Table 1, Continued

Technology	Functional purpose in insurance	Legal challenges	Areas of legal regulation
Cloud computing	Processing and storage of insurance data, providing remote access	Risks of data loss, leaks, dependence on IT service providers	Provider licensing, storage audits, resilience and security requirements

Source: compiled by the authors based on V. Chatzara (2020), D. Lanfranchi and L. Grassi (2021a), M. Han and D. Xu (2022)

Additionally, the development of InsurTech is accompanied by a number of ethical challenges that go beyond purely technical or legal regulation. One key challenge is algorithmic bias, which manifests itself when AI and Big Data analytics systems used to assess insurance risks can unknowingly reproduce historical social or gender biases. For example, if training samples contain data in which certain groups (women, the elderly, ethnic minorities) had lower insurance pay-outs or were more likely to be recognised as “high risk”, the algorithm may systematically underbid or raise rates for these categories. Such a case has been reported, for example, in the US in the use of algorithms in auto insurance, where men received more favourable offers than women under similar conditions (Owens *et al.*, 2022). This raises questions about the need for transparency of algorithms, ethical scrutiny, and legal defence mechanisms against discrimination in the digital environment.

One of the significant challenges of insurance digitalisation is the risk of over-detailing personalised insurance products through the collection and processing of personal data, including biometric, behavioural and health information (Yevseiev *et al.*, 2021; Yu & Xiao, 2023). While such data can improve the accuracy of actuarial calculations and tailor tariffs to individual risks, its use may violate the insured’s right to privacy and the protection of personal information. For example, the use of wearable devices that record physical activity, sleep or heart rate gives insurers access to medical data, enabling them to form more accurate but potentially discriminatory insurance offers (Charpentier & Vamparys, 2025). In addition, the automation of decision-making using algorithms may result in the denial of insurance benefits without human intervention, thus depriving the client of an effective appeal and violating the principles of fairness and procedural transparency. These aspects call for the development of not only legal but also ethical-legal standards, including ensuring transparency of algorithms, creating appeal procedures, and embedding fairness and non-discrimination in digital insurance practice.

Thus, InsurTech is not just a set of technological innovations, but a complex phenomenon that requires the creation of a new legal field capable of ensuring both the innovative development of the insurance sector and preserving the stability and predictability of legal relations in the digital environment. This field should be based on a combination of technological neutrality of law with simultaneous clarity of norms regulating the use of algorithms, data protection, digital identification and liability of participants in new insurance models.

**Analysis of the state of financial and legal regulation of the insurance market of Kazakhstan.** Financial and legal regulation of the insurance market of the Republic of Kazakhstan is a complex and multi-component system based on a number of legal acts of different legal force, including constitutional provisions, codified acts, laws, by-laws and industry standards regulating relations in the insurance sector. The main aim of this regulatory system is to ensure stability, transparency, protection of the rights of insurance market

participants, as well as harmonisation with international standards in the context of globalisation and digitalisation of the financial sector.

The foundation of legal regulation of insurance activities in Kazakhstan is laid in the Civil Code of the Republic of Kazakhstan (1999). It defines the legal nature of an insurance contract, the terms of its conclusion, performance, termination, as well as general requirements for insurance organisations. In particular, Article 817 of the Code sets out the two main types of insurance – compulsory and voluntary, while Articles 818-846 disclose the key provisions of an insurance contract, including insurable interest, insurance indemnity and grounds for refusal of payment.

The specialised legislation regulating the insurance sector of the Republic of Kazakhstan is Law of the Republic of Kazakhstan No. 126-II (2000). The law covers key aspects of insurance activity, including licensing, classification of insurance types, requirements for financial stability of insurance and reinsurance organisations, regulation of insurance brokers, actuaries and underwriters, as well as rules relating to reinsurance. In the course of 2020-2022, provisions were introduced into the Law aimed at adapting legal regulation to the conditions of digitalisation. In particular, the notions of “insurance platform”, “electronic insurance contract” and “insurance ombudsman” were enshrined, which indicates an attempt to form a legal basis for the functioning of InsurTech tools within the current legislation.

Regulatory mechanisms are also based on the provisions of Law of the Republic of Kazakhstan No. 474-II (2003), which defines the powers and functions of the Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan as the central authorised body in the field of insurance supervision. This law grants the Agency exclusive authority to issue, suspend and revoke licences, control compliance by insurance companies with solvency, capital, reserve and reinsurance requirements. The Agency also develops and approves normative legal acts regulating certain aspects of insurance activities.

Along with the above-mentioned acts, of significant importance are the regulatory resolutions of the Board of the National Bank of the Republic of Kazakhstan and later - the Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan, adopted to develop and detail the provisions of the codes and laws. In particular, these are the Resolution of the Board of the National Bank of the Republic of Kazakhstan No. 13 (2019), Resolution of the Board of the National Bank of the Republic of Kazakhstan No. 170 (2017), Resolution of the Board of the Agency of the Republic of Kazakhstan on Regulation and Development of the Financial Market No. 50 (2020), and also Resolution of the Board of the National Bank of the Republic of Kazakhstan No. 140 (2018). These documents are subordinate but legally binding and are aimed at adapting the sector to modern challenges, including digitalisation.

Since 2019, the Republic of Kazakhstan has seen the progressive introduction of electronic insurance policies, accompanied by the legal and regulatory enshrinement of

their legal status. In accordance with the provisions in the Civil Code of the Republic of Kazakhstan (1999) and acts of the Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan, electronic insurance contracts are recognised as equivalent to paper insurance contracts provided that they are issued through accredited digital platforms that meet information security requirements and ensure proper identification of the client. This practice is particularly intensified in the period 2020-2024 against the backdrop of the digitalisation of the financial sector. Additionally, the use of electronic policies is regulated by the Law of the Republic of Kazakhstan No. 370 (2003), which establishes the legal validity of electronic documents and the mechanism of their confirmation. Thus, the legal

basis for remote conclusion of insurance contracts and their legitimate use in the digital economy is being formed.

In addition, the Law of the Republic of Kazakhstan No. 94-V “On Personal Data and Their Protection” (2013), which establishes the basis for the legal collection, storage and use of personal data of insurance clients, is applicable in the field of data processing. It imposes obligations on insurance organisations to maintain confidentiality and data protection, which is especially important in the context of InsurTech implementation, when data analysis becomes a key element of insurance companies’ business models. The implementation of these requirements is the responsibility of authorised state bodies, the powers of which are presented in Table 2.

**Table 2.** Powers of the main state bodies in the sphere of regulation of the insurance market of the Republic of Kazakhstan

Legal basis	Main powers	Features in the context of digitalisation
<b>Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan</b>		
Law of the Republic of Kazakhstan No. 474-II (2003)	Licensing of insurance organisations and brokers. Establishment of capital, reserves and reinsurance ratios. Methodological and regulatory regulation. Supervision and application of sanctions. Development of insurance market strategy for insurance organisations and brokers	Implementation of digital insurance standards. Monitoring compliance with digital consumer rights. Adaptation of regulations to InsurTech, AI and Big Data
<b>Ministry of Finance of the Republic of Kazakhstan</b>		
Specific laws and by-laws	Formation of fiscal policy. Participation in the development of legislation. Issues of compulsory insurance. Interaction with IFIs	Participate in the digital transformation of budget and insurance mechanisms. Coordination of mandatory digital insurance programmes
<b>National Bank of the Republic of Kazakhstan</b>		
Law of the Republic of Kazakhstan No. 2155 (1995)	Macroeconomic analysis. Financial stability. Supporting the risk management system. Coordination with Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan	Promoting the sustainability of the insurance sector. Participating in the development of digital risk standards

**Source:** compiled by the authors

Despite the existence of a basic regulatory framework for personal data processing, law enforcement practice and existing legislation are not yet fully adapted to the challenges posed by the digitalisation of the insurance industry. This is particularly evident at the intersection of insurance and digital legal regimes, where clearer regulation of the rights and obligations of the parties, big data processing technologies and automated decision-making is required.

One of the key challenges is the lack of specific regulatory consolidation of categories and legal regimes related to the use of new digital technologies in insurance. Thus, in the current legislation – including the Law of the Republic of Kazakhstan No. 126-II (2000), Law of the Republic of Kazakhstan No. 474-II (2003) – there is no clear legal definition of such concepts as AI, smart contract, digital customer identification, blockchain platform etc. This leads to legal uncertainty in their use in insurance products and services.

The regulatory framework also lacks comprehensive provisions on legal liability for the actions of automated systems, especially in cases of damage caused by errors in risk assessment algorithms or failures of intelligent claims settlement systems. Given the increasing autonomy of digital solutions, there’s a need to develop regulations governing the degree of permissible automation, principles of algorithmic transparency, and rules for auditing decision-making algorithms.

In addition, with the mass use of Big Data and IoT technologies in insurance activities, the problem of insufficient regulatory elaboration of mechanisms for the protection of

personal and sensitive data is becoming more pressing. Despite the existence of the basic regulatory act – Law of the Republic of Kazakhstan No. 94-V “On Personal Data and Their Protection” (2013), its provisions are of a general nature and do not take into account the specifics of data processing in the insurance sector. Thus, Article 7 of this Law provides for the obligation of the operator to obtain the consent of the subject of personal data for their collection and processing, but does not disclose the specifics of obtaining informed consent in automated digital insurance systems, where interaction with the user is minimised. In addition, Article 22 of the same Law indicates the need to ensure confidentiality, integrity and availability of personal data during their storage and transmission. However, in the conditions of cross-border data transfer via InsurTech platforms, specific technical and organisational protection measures, such as encryption standards, access logging, as well as mechanisms for limiting algorithmic profiling of clients, especially in terms of non-human decision-making, are not regulated.

Insufficient regulatory clarity of procedures for recognising the legal validity of electronic documents and smart contracts in the insurance sector also remains a problem. In accordance with Article 4 of the Law of the Republic of Kazakhstan No. 370 (2003), an electronic document signed with an electronic digital signature is equal to a paper document if it is created and certified in accordance with the requirements of the law. However, this provision is of a general nature and does not take into account the peculiarities of the

conclusion, execution and cancellation of insurance contracts in the digital environment, especially with the use of automated platforms and smart contracts. This hinders the development of innovative microinsurance models, peer-to-peer insurance and flexible products based on dynamic pricing.

Separately, there is a lack of coordination between regulators (Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan, the National Bank, the Ministry of Finance) in the regulation of digital insurance products, which leads to legal duplication, gaps or conflicts of norms. In particular, issues related to certification of digital platforms, standardisation of API interfaces for data exchange, or cybersecurity procedures for insurance companies remain at the intersection of jurisdictions of different agencies without a single regulatory centre. Thus, the digitalisation of Kazakhstan’s insurance sector is outpacing the pace of regulatory adaptation. To overcome these gaps, it is necessary not only to update the existing legislation, but also to develop a fundamentally new regulatory framework based on a balance of technological neutrality and functional specificity.

**International experience of legal regulation of InsurTech.** The development of InsurTech globally is accompanied by the active formation of new legal approaches reflecting the rapid introduction of digital technologies in the insurance sector. The international experience of InsurTech legal regulation demonstrates the diversity of strategies and models determined both by technological development and the specifics of national legal systems and the level of maturity of financial markets. The world’s leading countries have already integrated InsurTech into the context of the digital transformation of financial regulation by developing appropriate framework approaches to supervision, licensing and consumer protection. One of the most advanced jurisdictions in InsurTech is the United Kingdom, where the regulator, the Financial Conduct Authority, has initiated a regulatory “sandbox” (Cornelli *et al.*, 2024). This mechanism provides insurance start-ups with the opportunity to test innovative products and services in a limited legal environment in co-operation with the regulator. This model has enabled a balance between innovation and consumer protection, and minimised legal risks during the implementation phase of new solutions. In addition, the United Kingdom implemented the Digital Regulation Cooperation Forum strategy, which coordinates the actions of different regulators in the context of digitalisation, including the InsurTech segment.

In the EU, the InsurTech regulatory architecture is based on a number of supranational legal acts aimed at harmonising digital standards in the financial sector, including insurance (Kamyshanskyi, 2025). One of the key documents is Regulation of the European Parliament and of the Council No. 910/2014 (2014) on electronic identification and trust services for electronic transactions in the internal market.

According to Article 25 of this Regulation, an electronic signature recognised in one EU Member State must also be legally valid in other Member States, thus providing a legal basis for the cross-border conclusion of insurance contracts in digital form.

In addition, Directive of the European Parliament and of the Council No. 2016/97 (2016) in Article 3 provides for the possibility of cross-border provision of insurance services subject to general consumer protection and disclosure requirements, including in electronic format. An important step was the Digital Finance Package initiative (European Commission, 2020), which includes a digital finance strategy and the Digital Operational Resilience Act (2025). The latter sets out requirements for cyber resilience, risk management, and the performance of IT service providers, which InsurTech companies are increasingly relying on.

The US, despite the absence of a single centralised regulation of the insurance industry, demonstrates flexible and innovative practices at the level of individual states. For example, New York State has a special division within the Department of Financial Services dealing with digital financial products, including insurance. The National Association of Insurance Commissioners has developed the InsurTech Innovation Hub, which coordinates the activities of market players and facilitates legal support for technological innovations. The key focus of US regulation remains ensuring transparency of algorithms, non-discriminatory access to insurance services and increasing the sustainability of digital infrastructure (Kolodiziev *et al.*, 2021).

In the Asia-Pacific region, Singapore and Hong Kong are taking active steps to create a legal environment for InsurTech. In Singapore, insurance fintech companies are regulated by the Management of monetary circulation, which has implemented an “open API” model and supports digital insurance platforms through the government’s FinTech Regulatory Sandbox programme. In Hong Kong, the Insurance Authority is implementing an InsurTech Facilitation Team strategy to advise market participants and support digital insurance projects Fintech Laws and Regulations Hong Kong 2024-2025 (2024). Both jurisdictions demonstrate an integrated approach covering both the technological and legal aspects of InsurTech integration.

In order to visualise the key differences in InsurTech legal regulation between the Republic of Kazakhstan and the world’s leading jurisdictions, it is useful to supplement the above analysis with Table 3. The EU is chosen as a reference model for comparison, as it is in this association that one of the most systematic and thoughtful approaches to digital regulation of the financial sector is observed. The EU legal architecture is characterised by a high level of harmonisation of rules covering such critical areas for InsurTech as digital identity, electronic contracting, personal data protection, cyber resilience and the promotion of technological innovation.

**Table 3.** Comparative characterisation of InsurTech legal regulation in the Republic of Kazakhstan and the EU

Criterion	Republic of Kazakhstan	EU
Electronic insurance contracts	Recognised at the legislative level, but there is no detailed regulation of conclusion/execution procedures via InsurTech platforms	Recognised as part of the Digital Finance Package strategy (European Commission, 2020), a legal framework for the use of smart contracts and remote contracting has been established
Digital identification of customers	Regulated by general legislation, but not adapted to the specifics of insurance activities	Regulated in accordance with Regulation of the European Parliament and of the Council No. 910/2014 (2014) – single electronic identification system for all financial services

Table 3, Continued

Criterion	Republic of Kazakhstan	EU
Personal data protection	Law of the Republic of Kazakhstan No. 94-V (2013) contains general norms without sectoral detailing in insurance.	Directive of the European Parliament and of the Council No. 2016/97 (2016) – sets high mandatory standards, including for insurance companies
Cybersecurity	There is no separate normative act; there are only general provisions in the sphere of information technologies	The Digital Operational Resilience Act (2025) contains clear requirements for insurance companies' IT infrastructures and technology service providers
Innovation support	There is no specialised regulatory sandbox focused on insurance technologies	Creates conditions for testing innovations through a pan-European Sandbox Framework within the framework of digital financial regulation

Source: compiled by the authors

Thus, international practice shows that successful regulation of InsurTech requires flexible legal mechanisms focused on preventing the risks of digitalisation, protecting consumer rights, and ensuring transparency and ethics of algorithmic solutions. Regardless of the regulatory model – centralised (EU), decentralised (US) or hybrid (Singapore) – legal certainty, innovation neutrality and ensuring trust in digital insurance products remain key priorities. In this context, the situation in the Republic of Kazakhstan is also illustrative, where industry experts estimate that the share of electronic insurance contracts will exceed 15% in 2023, which indicates a positive trend in the digitalisation of the insurance sector (Agency of the Republic of Kazakhstan on Regulation and Development of Financial Market, 2024). However, this indicator is significantly behind similar values in the EU countries, where the share of online contracts in some jurisdictions (e.g., the Netherlands, Estonia) reaches 35-40% (European Insurance and Occupational Pensions Authority, 2024). In the UK and Singapore, InsurTech solutions cover up to 20-30% of the insurance market, especially in the areas of motor and health insurance. In Kazakhstan, however, the share of InsurTech products in insurance companies' portfolios remains fragmented and concentrated mainly in motor insurance, while state support for innovation is still limited mainly to the fintech sector, with no clear coverage of insurance technologies.

**Prospects for improvement of regulatory policy in Kazakhstan.** The conducted comparative analysis with the EU legal system allowed to identify priority areas of reforms that require both legislative and institutional improvements. In this regard, it seems reasonable to put forward a number of recommendations that have the potential to ensure a balanced development of innovative insurance technologies while maintaining consumer protection and financial stability. The need to update the Law of the Republic of Kazakhstan No. 126-II (2000) is actualised. In particular, Article 1 of this law requires the addition of legal definitions of such concepts as “electronic insurance contract”, “smart contract”, “digital insurance platform”. The lack of legal consolidation of these concepts creates uncertainty when concluding insurance contracts using automated digital means. It also seems advisable to supplement Article 6 regulating the rights and obligations of insurance market participants with a provision on the possibility of using digital platforms accredited by a regulatory body. This approach is in line with the provisions of the EU Digital Finance Strategy, which provides a regulatory framework for the operation of smart contracts and remote contracting.

The second area of modernisation is the adaptation of the norms of the Law of the Republic of Kazakhstan No. 370 (2003) to the peculiarities of the insurance sector.

Article 3 of this law should be supplemented with a provision explicitly providing for the possibility of using electronic identification when providing insurance services. Such a measure is in line with the European Regulation of the European Parliament and of the Council No. 910/2014 (2014), which establishes mutual recognition of electronic identifiers in financial services, including insurance, and ensures a high level of cybersecurity and authentication.

Equally important is the harmonisation of approaches in the field of personal data protection. Law of the Republic of Kazakhstan No. 94-V (2013) is of a general nature and does not contain the industry specifics required for InsurTech. Given that digital insurance platforms process a significant amount of sensitive information, including medical information, it seems necessary to develop bylaws regulating the collection, storage, processing and destruction of personal data in digital insurance products. The provisions of Article 9 of the Directive of the European Parliament and of the Council No. 2016/97 (2016), which contains special rules on the processing of sensitive information. Empirical studies confirm that the implementation of these standards contributes to the increase in consumer confidence and the growth of capitalisation of InsurTech companies (Fras *et al.*, 2024).

A separate attention should be paid to the problem of the absence in Kazakhstan of a special regulatory document regulating the issues of cyber resilience of insurance companies. The introduction of a separate bylaw would allow structuring the requirements to the IT infrastructure of insurance organisations. Such a document should include provisions on mandatory testing of the resilience of technological systems, independent audits of digital vendors, and incident response protocols. Similar approaches have been implemented in the EU under the Financial Sector Digital Operational Resilience Act (2025), which sets minimum cybersecurity requirements. According to a report by Allianz (2024), cyber incidents were the second most common cause of insurance losses, which emphasises the importance of this issue.

In addition, the possibility of extending the regulatory sandbox mechanism to the insurance sector should be considered. The current Law of the Republic of Kazakhstan No. 193-VII ZRK “On Digital Assets in the Republic of Kazakhstan” (2023) does not contain provisions explicitly authorising the testing of innovative insurance products. In this regard, it is recommended to expand its scope taking into account the introduction of specialised regulatory sandboxes for insurance companies. International experience, in particular the example of Singapore, demonstrates the high efficiency of such a mechanism. Thus, the improvement of regulatory policy in the Republic of Kazakhstan should be based on the gradual updating of the current legislation

taking into account the digital specifics of insurance, adoption of bylaws and implementation of the EU best practices. Such an approach will not only ensure harmonisation of Kazakh legislation with international standards, but will also contribute to the formation of a competitive InsurTech environment adapted to the challenges of the digital economy.

### Discussion

As a result of analysing the theoretical and legal foundations of InsurTech and insurance regulation, it was found that the existing legal structures in most cases do not reflect the specifics of the digital transformation of the insurance industry. The provisions of traditional insurance law were predominantly developed with analogue business models in mind and proved to be poorly applicable to hybrid and automated digital platforms. The findings demonstrated a lag in the doctrinal understanding of the legal status of InsurTech and the legal risks associated with it.

A similar position was presented in the study by D. Lanfranchi and L. Grassi (2021b), which emphasised that the transition of insurance companies to innovative digital models was accompanied by a fragmented regulatory support. The authors concluded that legal uncertainty regarding new digital products and distributed technologies is a key obstacle to the sustainable integration of innovation in the insurance sector. These observations supported the conclusion that the basic concepts of insurance law need to be revised to take into account the technological context.

The study by I. Sosa and O. Montes (2022) also revealed that the successful development of InsurTech requires not only technological investments, but also a comprehensive transformation of the institutional and regulatory landscape. According to their findings, InsurTech is changing the very nature of the insurance service, making it more interactive, algorithmic and personalised, which is not always reflected in the current legal regulation. The results obtained in the course of the analysis of the theoretical and legal foundations of InsurTech confirmed this assertion: the absence of unified approaches to the legal recognition of algorithmic solutions, virtual agents and smart contracts in insurance was recorded.

In the work of X. Xu and P. Zweifel (2020) proposed a conceptual framework for InsurTech assessment, in which the key element is the degree of legal compatibility of innovative business models with existing regulations. It was emphasised that the effectiveness of InsurTech is inextricably linked to the legal validation of technological solutions. This conclusion correlated with the results of the present analysis, which emphasised the lack of regulatory clarity in relation to digital insurance channels, cross-border service delivery and the regulation of decision-making algorithms.

The focus of this study was on the institutional and regulatory aspects of InsurTech adoption, identifying key gaps and challenges in financial and legal regulation. The analysis of the financial and legal regulation of the insurance market in Kazakhstan revealed that, despite the existence of a basic regulatory infrastructure, the existing regulation was not sufficiently adapted to the rapidly developing digital innovations in the insurance sector. This conclusion was also reflected in international studies, which emphasised the need to transform regulatory approaches in the context of InsurTech implementation.

Thus, in the study by Zh. Hristozov and R. Vazov (2025) found that European regulators faced similar challenges

already in the early 2020s and responded to them by adopting specialised insurance digitalisation strategies, adapting data protection regulations and updating oversight mechanisms for algorithmic platforms. In contrast to European practice, Kazakhstan has lagged behind in the regulatory interpretation of key concepts such as digital insurance product, algorithmic underwriting and automated claims processing. This lag reduces the potential for investment attraction and technology transfer in the national insurance market.

A study by J. Liu *et al.* (2023) demonstrated that the level of technological innovation in insurance companies directly depends on the presence of an incentivising regulatory environment. In the case of Kazakhstan, it was recorded that with the formally declared digital transformation of the sector there are no clear regulations on the introduction of innovative solutions, which restrains technological development and reduces the competitiveness of national insurance. This also creates risks of market fragmentation and increases the gap between large and small participants, who are unevenly prepared for digital transformation.

According to the findings of M. Eling *et al.* (2022), AI has the potential to radically change the insurance value chain, but only if there is appropriate legal certainty regarding the transparency of algorithms and the allocation of liability. In the Kazakh context, there has been regulatory uncertainty regarding liability for AI-based decisions, as well as a lack of institutional regulation of algorithmic risks. Such a regulatory vacuum could be a source of legal conflict and undermine consumer confidence in digital insurance services.

In addition, the results of the study by V. Murinde *et al.* (2022) confirmed that successful integration of FinTech solutions in insurance requires flexible coordination between central banks, financial agencies and industry participants. An analysis of Kazakh practice has shown institutional fragmentation, which is reflected in the disparate functions of the Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan, the Ministry of Finance and the National Bank, especially with regard to digital innovation and systemic risks. Without effective interagency coordination and consolidation of competences, the digital transformation of the insurance sector remains limited and fragmented.

Based on the analysis of the international experience of InsurTech legal regulation, it was revealed that the most successful models of legal support for digital transformation in the insurance industry have been formed in jurisdictions with flexible regulatory policies aimed at stimulating innovation while preserving the basic principles of consumer protection. The approaches established in the course of the study in the United Kingdom, the EU, the United States and Asia-Pacific countries confirmed the importance of regulatory sandboxes, multi-level supervision and coordination between sectoral regulators.

The results are consistent with the findings of J.J. Goo and J.-Y. Heo (2020), who emphasised that the implementation of regulatory sandboxes has a positive impact on the development of fintech ecosystems, including InsurTech, by reducing regulatory uncertainty and creating an experimental environment for testing innovative solutions. Similarly, the countries analysed - primarily the United Kingdom and Singapore - employ a sandbox regulatory strategy, which is consistent with their observations of the need for a combination of flexibility and institutional oversight.

As part of the comparison with the study by P. Marano and M. Siri (2021), it was confirmed that in the EU, the InsurTech regulatory landscape is evolving in an environment of digital harmonisation within financial legislation, with a focus on cross-border service provision and electronic identification. The analysis of European practice (e.g., in the context of the Digital Operational Resilience Act and the General Data Protection Regulation) has shown consistency with the authors' assertion that InsurTech regulation in the EU is based on the principle of "innovation neutrality", providing the same conditions for both traditional insurers and digital platforms.

Thus, the gaps and inconsistencies in the legal regulation of Kazakhstan's insurance market identified in the course of the analysis have found correlation with international studies, which indicates the universality of the challenges, but emphasises the need for nationally oriented and proactive regulatory solutions. Strengthening institutional interaction, adapting legislation to digital realities and introducing a risk-based approach to regulation may become key steps towards improving the sustainability and efficiency of the insurance sector.

### Conclusions

The legal-theoretical analysis of InsurTech has revealed that the digitalisation of the insurance sector has already led to the transformation of key concepts and institutions of insurance law. Innovative technologies, such as AI, big data, blockchain, IoT, smart contracts and cloud computing, contribute to changing traditional approaches to the conclusion, execution and settlement of insurance contracts. Such changes were found to require the adaptation of existing insurance and financial regulations to the new digital environment, including the legal recognition of automated solutions, the digital form of contracts and the allocation of liability between actors in the digital ecosystem. These findings laid the foundation for further research into the specifics of InsurTech legal regulation in the Republic of Kazakhstan and identifying areas for its improvement.

An analysis of the current financial and legal regulation of the insurance market of the Republic of Kazakhstan shows that there is a comprehensive, but in some aspects fragmentary, legal framework. The basis of regulation is Law of the Republic of Kazakhstan No. 126-II "On Insurance Activity", supplemented by specialised by-laws. The central regulator is the Agency for Regulation and Development of the Financial Market of the Republic of Kazakhstan, which has broad powers in licensing, supervision, standards development and strategic planning. The Ministry of Finance plays an important coordinating and fiscal-policy role, while the National Bank retains macroeconomic stability and systemic risk functions.

However, the accelerated digitalisation of the sector (InsurTech, Big Data, AI) reveals legal gaps and regulatory inertia in regulating new forms of insurance relations. The current regulations do not cover the specifics of online insurance, the protection of consumers' digital rights, the use of algorithmic risk assessment models and digital platforms. In addition, there is insufficient integration of the norms on personal data and digital security into the sphere of insurance regulation.

InsurTech's analysis of international regulatory experience found that key trends have been the introduction of flexible regulatory regimes, the development of regulatory sandboxes, the legal recognition of digital insurance platforms and the adaptation of legislation to the use of AI, big data and blockchain technologies in insurance activities. Jurisdictions such as the United Kingdom, Singapore and EU states show the greatest regulatory receptivity to innovation, while maintaining a balance between technological development and consumer protection.

It was found that the success of InsurTech regulation depends to a large extent on a systematic approach to the digitalisation of financial markets, as well as the existence of specialised regulatory mechanisms that allow new insurance technologies to be tested in a controlled environment. In addition, the trend towards internationalisation of digital standards and harmonisation of legal frameworks has been confirmed, which has led to the formation of uniform principles of InsurTech regulation at supranational level, in particular within the EU.

International experience has shown that effective regulation of InsurTech requires not only the adaptation of existing legal structures, but also the development of new regulatory categories that take into account the specifics of digital technologies and the changing nature of insurance relations in the context of digital transformation. Consequently, further development of financial and legal regulation of the insurance market of Kazakhstan should be focused on the formation of an integral digital legal architecture that ensures adaptability, sustainability and protection of market participants' interests in the conditions of transformation of insurance business models.

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## Інноваційні підходи до фінансово-правового регулювання страхових продуктів в епоху InsurTech

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**Анотація.** Стаття була спрямована на вивчення правових особливостей і виявлення актуальних проблем регулювання інноваційних страхових продуктів, що функціонують з використанням технологій InsurTech. У дослідженні застосовано порівняльно-правовий метод для зіставлення норм казахстанського та міжнародного законодавства у сфері страхування. Формально-юридичний і системний підходи використовувалися для аналізу структури і змісту нормативно-правових актів, що регулюють InsurTech-продукти. Метод правового моделювання дозволив обґрунтувати перспективи розвитку фінансово-правового регулювання з урахуванням цифрової трансформації страхового ринку. Під час дослідження детально проаналізовано сутність InsurTech як інтеграції цифрових технологій у страхову сферу, що дало змогу виокремити ключові напрями трансформації галузі, включно зі смарт-контрактами, автоматизованою оцінкою ризиків і персоналізованими цифровими продуктами. Дослідження поточного стану правового регулювання страхової діяльності в Республіці Казахстан виявило низку прогалин, зокрема відсутність нормативного закріплення понять, пов'язаних із цифровими страховими сервісами, а також недостатню гнучкість правових механізмів для реагування на технологічні зміни. У результаті аналізу міжнародного досвіду було встановлено, що в ЄС та США впроваджено спеціалізовані регуляторні режими, як-от «регуляторні пісочниці», що дають змогу тестувати цифрові страхові продукти в контрольованих умовах із мінімальним регуляторним навантаженням. Розглядалися такі механізми, як FinTech Regulatory Sandbox і InsurTech Innovation Hub, що забезпечують гнучкість регулювання при збереженні належного рівня захисту споживачів. Аналіз показав, що подібні ініціативи сприяють прискореній інтеграції інновацій у страховий сектор і можуть бути адаптовані до казахстанських умов з урахуванням місцевих правових та інституційних особливостей. На основі порівняльного аналізу було запропоновано рекомендації для Казахстану, включно з розробленням правових дефініцій, розширенням функціоналу агентства фінансового нагляду в частині InsurTech, а також упровадженням правового механізму «регуляторної пісочниці» з метою стимулювання інновацій за умови дотримання вимог правової визначеності та захисту споживачів

**Ключові слова:** страхове право; цифрові технології; штучний інтелект; блокчейн-технології; автоматизовані системи оцінки ризиків; цифрова ідентифікація