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PROSPECTS FOR APPLYING ARTIFICIAL INTELLIGENCE, BIG DATA, AND DIGITAL UNDERWRITING SYSTEMS IN PERSONAL INSURANCE PRACTICE

Isaeva Xolbibi Boboqulovna
Independent Researcher,
Tashkent State University of Economics

Abstract

This paper explores the prospects for utilizing artificial intelligence, Big Data, and digital underwriting systems within personal insurance—specifically life, health, and accident insurance. It provides a detailed analysis of the systemic challenges hindering the adoption of these technologies in the national context, including a lack of comprehensive databases, regulatory gaps, personal data protection concerns, algorithmic bias, limitations in human resources and technological capacity, cybersecurity issues, and model risk. The paper offers institutional, legal, and practical recommendations to address these challenges, including a model for the phased implementation of digital underwriting.

Keywords: personal insurance, artificial intelligence, Big Data, digital underwriting, accelerated underwriting, machine learning, algorithmic fairness, model risk, personal data, InsurTech.

Introduction

Underwriting is considered the most labor-intensive component of personal insurance. In this process, the insurer decides whether to accept or decline a risk and determines its price. In traditional practice, a client completes a questionnaire and undergoes a medical examination, while documents are reviewed manually.

Artificial intelligence and big data analytics allow for risk assessment based on a multitude of factors. Decisions on standard applications can be reached in just a few minutes [9; 11].

This field is developing rapidly in foreign markets. Gen Re conducted a study among 30 insurers in the United States, which found that, on average, 59% of individual life insurance applications are suitable for an accelerated—or even fully automated—underwriting process [8]. Furthermore, a survey by Accenture involving 430 executives indicates that 14% of organizations currently make extensive use of artificial intelligence in underwriting. This share is projected to reach 70% by 2028 [7]. According to estimates by Swiss Re, global life insurance premiums are expected to grow from $3.1 trillion in 2024 to $4.8 trillion by 2035 [6]. In 2025, life insurance premiums in Uzbekistan grew by 104.8%, reaching 586.5 billion soums. However, they account for only 4.4% of the total 13.46 trillion soums in insurance premiums [13]. The "Digital Uzbekistan – 2030" strategy [3] and the strategy for the development of artificial intelligence until 2030 [4] have identified digitalization as a priority. Yet, while the artificial intelligence strategy includes tasks such as fraud detection and creditworthiness assessment for the banking and financial sector, insurance is not explicitly addressed as a distinct area. The rapid growth of the personal insurance market, contrasted with the lagging state of its digital infrastructure and regulatory framework, underscores the relevance of this topic.

Analysis has revealed several systemic issues associated with the implementation of digital underwriting in personal insurance practices:

- a lack of databases and the fragmentation of existing data. Machine learning models require training based on historical data spanning several years and consisting of hundreds of thousands of records. In Uzbekistan, the life insurance portfolio is relatively young and small. In 2025, insurance payouts in this sector

amounted to only 140.5 billion soums [13]. This is statistically insufficient for developing models related to mortality and morbidity. Furthermore, medical, tax, banking, and demographic data are scattered across the systems of various agencies, and there is no mechanism in place to facilitate the exchange of this information based on a unified standard. Consequently, insurers are compelled to rely on pre-existing models developed abroad—models trained on data from different populations. Such models may inaccurately assess local risk profiles;

- the existence of a regulatory and legal gap. The Law "On Insurance Activity" [1] lacks provisions regarding underwriting decisions made by fully automated systems. Specifically, there are no defined regulations concerning algorithmic pricing, a client's right to be informed of the reasons for a rejection, or procedures for appealing such decisions. In the European Union, by contrast, artificial intelligence systems used for risk assessment and pricing in life and health insurance are classified as "high-risk." These systems are subject to mandatory requirements concerning risk management, data quality, human oversight, and transparency [5]. In Uzbekistan, however, no such legal framework exists. This creates legal uncertainty for insurers and slows down innovation;

- requirements regarding the protection and localization of personal data. Digital underwriting relies on the processing of highly sensitive information, such as health-related data. The Law "On Personal Data" [2] establishes general principles; however, it does not specifically regulate issues concerning automated decision-making and profiling, nor does it define the procedures for obtaining consent to process medical data for insurance purposes. The law also mandates that citizens' data be stored on servers located within the territory of Uzbekistan. This restricts the direct use of foreign cloud-based artificial intelligence platforms, while local computing infrastructure remains insufficiently developed;

- algorithmic bias and a lack of transparency. Models may replicate imbalances present in historical data. Furthermore, they could discriminate against certain groups through indirect indicators—such as purchasing habits or residential addresses—that are closely linked to factors like gender, income, or location. Such a situation leads to the exclusion of the population segments most in need of insurance and runs counter to the goals of financial inclusion [12]. Complex models often operate on a "black box" principle—meaning they do not provide an explanation as to why an application was rejected or why a premium was increased;

- a shortage of personnel and technological capacity. Digital underwriting requires specialists who possess expertise across actuarial science, medicine, data analysis, and insurance law—a combination that is currently very rare in the market. Furthermore, the core information systems of most insurers are outdated and incapable of communicating with external data sources in real time. For smaller insurers, the costs associated with developing and maintaining their own models are prohibitively high. Consequently, the technological gap within the market continues to widen;

- cybersecurity and model-related risks. The aggregation of customers' medical and financial data makes them an attractive target for cybercriminals. Additionally, the use of artificial intelligence tools has made it easier to fabricate medical documents and data. Moreover, the accuracy of a model may decline over time, or it may begin to produce errors; yet, practices for managing model-related risks are virtually non-existent within insurance organizations.

In our view, addressing these challenges requires the implementation of the following interconnected measures:

- the creation of a national platform for insurance data. A platform for sharing anonymized statistics on mortality, morbidity, and losses among insurers should

be established under the initiative of the insurance regulatory authority. This platform can serve as a foundation for developing national mortality and morbidity tables specific to the sector. In a second phase, the platform should be integrated with state medical, tax, and social registries. Such integration must be facilitated through standard API interfaces, based on digital consent provided by the client via the state services portal. Consequently, models can be trained on local data, while clients are spared the burden of undergoing medical examinations or gathering documentation;

- a regulation on algorithmic underwriting should be adopted. It is advisable for the regulatory authority to develop a specific regulation based on the EU approach [5] as well as the principles established by the IAIS and EIOPA [10; 14]. This regulation should mandate requirements such as: registering underwriting models with the regulatory authority; documenting and independently validating these models; and ensuring that a final decision is made by a human in cases where an application is rejected or involves large insurance sums. Furthermore, clients must be granted the right to be informed of the reasons for a rejection in plain language and to request a review of the decision. It is also essential to prohibit the use of attributes such as ethnicity, religion, or genetic data in the underwriting process. - Legislation concerning personal data needs to be improved. Specifically, a dedicated article regarding automated decision-making and profiling should be incorporated into the law. A procedure for obtaining explicit and separate consent for the processing of medical data for insurance purposes must be established. Furthermore, in compliance with data localization requirements, a secure computing environment for insurers should be created within local data centers. This could be implemented leveraging the computing resources being developed as part of the artificial intelligence strategy [4];

- a system for managing model fairness and model risk must be implemented. Underwriting models should be subject to a mandatory annual independent audit. This audit must assess—based on specific quantitative metrics—whether any discrimination exists with regard to gender, age, or geographic location. The use of explainable models and explanation techniques (such as SHAP values) should be encouraged. Furthermore, it is essential to continuously monitor for any decline in model accuracy and to establish accountability for model risk at the Board of Directors level;

- digital underwriting should be implemented in stages. In the first stage, rule-based automated underwriting will be introduced for accident insurance (with low coverage amounts) and term life insurance; here, artificial intelligence will be used to screen applications. The second stage will involve "accelerated" underwriting, which utilizes external data sources (with the customer's consent). In the third stage, dynamic health insurance products—linked to data from smartwatches and telemedicine services—will be developed on an opt-in basis. For smaller insurers, a shared cloud-based underwriting platform—provided by reinsurers or a consortium—would significantly reduce costs. It is advisable to introduce a "regulatory sandbox" regime—similar to the one applied in the capital market since 2023—into the insurance sector to facilitate the testing of new products;

- strengthening human resource capacity and cybersecurity. Master's degree programs in "Insurance, Actuarial Science, and Data Analysis" should be established at higher education institutions. Professional development courses on the fundamentals of machine learning should be organized for underwriters, and a certification system for actuaries must be implemented. In the realm of cybersecurity, the following measures should be made mandatory: the encryption of medical data, the regular conduct of penetration testing, and the requirement

to notify the regulatory authority within a specified timeframe in the event of a data breach.

Artificial intelligence and Big Data can shorten underwriting timelines in personal insurance, reduce costs, and align pricing with a client's actual risk profile. However, the effectiveness of this technology depends on three factors: data quality, legal safeguards, and the fairness of the models. If the proposed data platform, algorithmic underwriting framework, model audit, and phased implementation model are implemented comprehensively, digital underwriting will become a reliable driver of growth for the personal insurance market.

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