



# Insurance Technology Enhances the Management Efficiency of the Insurance Industry by Reducing Information Asymmetry

Ruoyang Wu<sup>1</sup> and Haotong Yang<sup>2,\*</sup>, Mohan Zhang<sup>3</sup>

<sup>1</sup> School of Finance, Tianjin University of Finance and Economics, Tianjin 300221, China

<sup>2</sup> Adam Smith Business School, University of Glasgow, Glasgow, United Kingdom

<sup>3</sup> Beijing No. 13 Middle School, Beijing, 100009, China

\*2841005Y@student.gla.ac.uk

**Abstract.** The insurance industry has long faced efficiency issues caused by information asymmetry, including inaccurate risk assessment, difficulty in identifying fraud, and high operating costs, leading to widespread adverse selection and moral hazard. In recent years, insurance technology (InsurTech), represented by big data, artificial intelligence (AI), and blockchain, has provided new ways to improve information transparency and management efficiency. This paper aims to explore how InsurTech can mitigate information asymmetry to improve decision-making efficiency, operational efficiency, and customer response efficiency. Based on information asymmetry theory and data-driven decision-making models (DDDM), this paper constructs a causal analysis framework for the impact of technological interventions on management performance. In terms of research, three companies—Ping An Insurance (a representative of traditional insurance companies undergoing digital transformation), ZhongAn Insurance (a domestic internet insurance platform), and Lemonade (a global digital-native insurance company)—were selected for a comparative case study. The findings reveal that initiatives such as AI-assisted fraud detection, blockchain-enhanced data trustworthiness, and big data-supported personalized pricing have significantly optimized management efficiency in risk identification, process automation, and customer response for insurance companies. This paper not only provides a theoretical basis for understanding the efficiency improvement mechanisms driven by technology but also offers practical insights for insurance companies advancing their digital transformation.

**Keywords:** Insurance Technology, Information Asymmetry, Data-Driven Decision-Making, Management Efficiency, Case Study.

## 1 Introduction

For far too long inefficiency has gripped the insurance industry, regularly expressed in poor risk evaluation and an inability to prevent fraud, while customer data remains stranded. Because of these structural impositions, the phenomenon of adverse selection

© The Author(s) 2026

A. J. Moshayedi (ed.), *Proceedings of the 2025 International Conference on Hybrid Commerce, Human Capital, and Economic Dynamics (ICHCH 2025)*, Advances in Economics, Business and Management Research 374, [https://doi.org/10.2991/978-2-38476-585-0\\_87](https://doi.org/10.2991/978-2-38476-585-0_87)

and moral hazard was salient, and it aggravated information asymmetry between insurance companies and policyholders [1,2]. To address these issues, InsurTech has stepped in to provide fresh solutions to the space. By leveraging technologies such as artificial intelligence, big data analysis, blockchain, and cloud computing, InsurTech aims to enhance data transparency and operational traceability, thereby effectively mitigating information asymmetry [3, 4]. This study aims to explore how InsurTech can improve management efficiency in the insurance industry by reducing information asymmetry. While existing research has examined the application of InsurTech in various business scenarios, systematic analysis of the causal mechanism of “how technology affects information structure and thereby changes management performance” remains limited.

Theoretically, this paper builds on information asymmetry theory to construct a technology-risk-efficiency conceptual model, exploring how insurance technology optimizes management from three dimensions: decision-making efficiency, operational efficiency, and customer response efficiency. Through case studies of three representative companies, the research not only expands the theory of information asymmetry in the digital environment but also provides practical references for insurance companies' digital transformation.

## 2 Literature Review

The theory of information asymmetry refers to the situation in market transactions where parties have different levels of information, with those who possess more information potentially holding an advantage, while those with less information may be at a disadvantage. In the insurance market, this theory has multifaceted implications for insurance efficiency, leading to moral hazard and adverse selection. Due to information asymmetry, insured parties may alter their behaviour after purchasing insurance, taking actions detrimental to the insurance. The presence of moral hazard increases the probability and cost of claims for insurance companies, thereby reducing the efficiency of the insurance market. Information asymmetry causes high-risk policyholders to be more inclined to purchase insurance, while low-risk policyholders may choose not to purchase insurance. This leads to an increase in the risk level within the insurance company's risk pool, necessitating an increase in insurance premiums. This, in turn, may cause more low-risk policyholders to exit the market, creating a vicious cycle that disrupts the normal operation and efficiency of the insurance market. Due to asymmetrical information, insurance companies find it difficult to accurately assess the risk status of policyholders, leading to situations where high-risk businesses may be undervalued and enter the market, or low-risk businesses may be excluded due to excessively high premiums. This prevents insurance resources from being optimally allocated, thereby reducing market efficiency.

Adverse selection refers to a situation where, under conditions of information asymmetry between the two parties to a transaction, inferior goods drive superior goods out of the market, resulting in a market equilibrium quantity that is less than the optimal, efficient market equilibrium. In the insurance underwriting process, policyholders lev-

erage their information advantage to conceal high-risk characteristics and obtain insurance coverage. In the health insurance context, individuals with undiagnosed chronic conditions may conceal abnormal medical test results or medical history to secure standard-rate premiums, resulting in insurers facing higher-than-expected portfolio risks; In the context of car insurance, drivers with poor driving habits (such as frequent sudden braking or long-distance night driving) exploit gaps in insurance companies' collection of behavioural data to enjoy premiums similar to those of low-risk drivers, thereby disrupting the 'risk-premium' matching mechanism [5, 6]. Existing research has confirmed that adverse selection increases industry claim ratios (by an average of 12%-18%), but there is a lack of technology-driven solutions for 'how to dynamically identify high-risk individuals.'

Moral hazard refers to the phenomenon where, under conditions of information asymmetry, uncertain or incomplete contracts result in economically responsible actors not bearing the full consequences of their actions, thereby maximising their own utility while engaging in behaviour detrimental to others. After purchasing insurance, insurance coverage may incentivise policyholders to alter their risk-taking behaviour. Traditional research has focused on quantifying the economic losses associated with moral hazard (e.g., claims costs exceeding 30% of premiums) but has not thoroughly explored technical approaches for 'comprehensive behaviour monitoring and intervention.

Data-Driven Decisions for Management (DDDM) is a decision-making strategy that follows the utilisation of data and analytics to provide companies with stances on risk management or operational optimisation. It is very important for businesses to gather internal and external data—including operational, market, and customer behaviour. It is also important that businesses need to verify the quality, accuracy and the completeness of data. Using statistical methods, machine learning algorithms, etc., the data is cleaned, integrated and processed to fetch people accurate insights & information. Enterprises need to set up Data Visualisation platforms which will assist in assisting Senior Management and employees to quickly understand the analysis output. Therefore, enterprises can make a more scientific and accurate decision based on the conclusions of the analysis. For one, product development teams can tweak product design leveraging from market demand and consumer preferences; the marketing department can use user profiles to curate targeted promotions etc. The latter requires companies to track the implications of their decisions so that they can correct courses in an agile fashion if the stated strategies do not actually deliver anticipated outcomes. At the same time, they need to continuously improve data literacy, cultivate data awareness among all employees, and form a data-driven corporate culture. By establishing an insurance technology platform through digital means, information asymmetry issues in the insurance industry, including adverse selection and moral hazard, can be effectively reduced. The widespread application of insurance technology enables efficient business processes and comprehensively promotes improvements in management efficiency, including decision-making efficiency, operational efficiency, and customer response efficiency, for insurance institutions.

### 3 Current Status and Key Technologies of InsurTech Development

#### 3.1 Current Status of Insurance Technology Development

In the past few years, three core technologies: big data analysis, AI, and blockchain have played a crucial role in improving operational efficiency, decision-making quality, and eliminating information asymmetry problems in InsurTech-related key links such as underwriting and claim processing. First, big data technology helps insurers process and analyse vast quantities of diverse data, including customer behaviour, social media feeds and Internet of Things (IoT) data that significantly enhance risk assessment as well as pricing. For example, Ping An Insurance has integrated over 200 data sources to build a health risk model, reducing the average claims processing time for health insurance from three days to 1.5 days [7]. Second, artificial intelligence (including machine learning, natural language processing, and image recognition) has been widely applied in automated underwriting, fraud detection, and intelligent customer service. Lemonade, a digital insurance company, uses an AI system to approve small claims in 3 seconds, and its chatbot interface has significantly reduced customer response times [8]. Finally, blockchain technology, with its decentralised and immutable characteristics, addresses trust and transparency issues in insurance contract execution and claims processing. ZhongAn Insurance has introduced a blockchain-based 'policy chain' system, effectively preventing duplicate claims and enhancing the efficiency and reliability of multi-party data verification. Overall, these three technologies complement each other: big data enhances predictive capabilities, AI drives process automation, and blockchain ensures data reliability and execution security, collectively forming the technological foundation for intelligent and efficient insurance operations.

In traditional insurance business, insurance companies have long faced serious information asymmetry issues. Insurance companies can only rely on questionnaires, medical examinations, or historical claims records to assess risk, which easily leads to adverse selection and moral hazard, damaging the efficiency of the insurance market [1]. With the development of insurance technology, the means of information collection, processing methods, and transparency have been significantly improved, enabling insurance companies to assess customer risk in a more comprehensive, dynamic, and refined manner, thereby achieving precise management.

Insurance companies have significantly enhanced their ability to obtain data from multiple sources. With the application of big data, IoT, wearable devices, social media channels and third-party data platforms to insurance technology, insurance companies have begun recording their customer's every movement and character in enormous detail. One such example is insurance, which has the opportunity to observe how a policyholder drives a car via connected vehicle data - which may be used in real-time events (car insurance pricing). By collecting heart rate, sleep quality and activity levels through the wearable devices of their customers, health insurance companies can better assess the health risks. These data sources are diverse and real-time enough to more than make up for the limitations of information available through conventional underwriting in accurately evaluating a customer's true risks.

Insurance companies have significantly improved the accuracy of their risk assessments. While collecting large amounts of data, insurance companies use machine learning and artificial intelligence algorithms to model and analyse customer behaviour, claim patterns, disease incidence probabilities, and other factors, thereby transforming risk assessment from static to dynamic and from rule-driven to data-driven. For example, Ping An Insurance uses AI and customer social data to build 'risk profiles' and combines historical claims data to adjust pricing strategies in real time. Lemonade uses deep learning to model customer reporting behaviour and accurately identify potential moral hazards. The application of technology has not only improved prediction accuracy but also made individualised pricing possible, significantly reducing the probability of issues such as 'high-risk customers paying low premiums' or 'low-risk customers exiting the market.'

The introduction of insurance technology has improved information transparency, further promoting market trust. The introduction of blockchain technology ensures the authenticity, traceability, and shareability of insurance data. This is especially true in the claims process, where it enhances data connectivity between insurance companies, hospitals, and judicial appraisal institutions, enabling customer behaviour and claims records to be uniformly recorded on the chain, thereby reducing the possibility of fraud and abuse. Additionally, technologies such as AI customer service and visualised reports have improved customers' understanding of policy terms and claims processes, to some extent resolving disputes caused by 'weak customer understanding' and 'transparent terms.' Theoretically, insurance technology reduces the interference of asymmetric information in resource allocation by enhancing information acquisition, analysis, and sharing mechanisms. Specifically, more accurate risk data, earlier behavioural predictions, and more automated decision-making processes enable insurance companies to identify customer characteristics and potential risks more precisely, reducing reliance on 'average premium' strategies. This mitigates adverse selection beforehand and identifies moral hazards during the process.

### **3.2 Definition and Measurement Methods of Management Efficiency**

In the context of insurance technology driving corporate transformation, clearly defining the dimensions and quantitative indicators of management efficiency can help systematically assess the impact of technology applications on organisational performance. This article divides the management efficiency of insurance companies into three interrelated dimensions: decision-making efficiency, operational efficiency, and customer response efficiency. Decision-making efficiency primarily reflects a company's ability to make timely and accurate decisions in risk assessment, underwriting, and pricing processes. Typical metrics include fraud detection rates, underwriting approval rates, and risk pricing deviation rates. Operational efficiency emphasises the effectiveness of resource allocation and business process execution. Common metrics include average claim processing time, cost per case, IT system automation rates, and employee productivity per capita. Customer response efficiency focuses on the timeliness and satisfaction level of customer service, typically measured through metrics such as first

response time, customer issue resolution cycle, satisfaction scores, and intelligent customer service usage rate [9]. These three dimensions collectively form the core evaluation framework for efficiency optimisation in insurance companies' digital transformation, providing a theoretical foundation and measurement framework for subsequent empirical research.

## **4 Research Method and Case Analysis**

### **4.1 Ping An Insurance: Intelligent Middle Platform and Process Automation**

The intelligent middle platform serves as a bridge connecting business and data, undertaking the task of integrating the business middle platform and data middle platform, enabling the automation and intelligence of business processes. Ping An Insurance leverages the intelligent middle platform to utilise big data and artificial intelligence algorithms in underwriting and claims processing to conduct quantitative risk analysis of policyholders. Ping An Insurance leverages the intelligent middle platform to utilise big data and artificial intelligence algorithms in underwriting to conduct quantitative risk analysis of policyholders. When policyholders fill in their detailed personal information on Ping An Insurance's official website, Ping An Financial Manager App, or other designated official channels, the system can quickly provide underwriting opinions. For example, with the support of intelligent underwriting, 94% of new policies are automatically reviewed, greatly reducing the time from application to underwriting, providing consumers with a convenient insurance experience, eliminating the need to wait for underwriting results, and reducing delays that may be caused by manual review. In claims processing, the intelligent middle platform plays a crucial role in advancing the digital operations strategy. Take intelligent pre-claims assessment as an example: through data analysis and modelling, claims cases are assessed for risk. The risk levels of claims cases are identified thanks to the big data analysis along with artificial intelligence technology which in turn aids reduce the company's operational costs reasonably, while at the same time enhance its claims processing efficiency. All a customer needs to do is submit claims via the online platform and the system will automatically license investigator acute ascending tastes as well as risk assessments resulting in a much shorter time processing claims. Customers can also follow the status of their claim, anywhere, anytime which drastically increases consumer satisfaction as well. Ping An Insurance has introduced artificial intelligence technology, enabling the intelligent middleware platform to automatically recognise and classify claims materials, reducing the workload and time required for manual processing of claims materials, improving claims processing efficiency, and reducing the likelihood of errors or omissions caused by human factors. Ping An Insurance's big data applications have directly created a competitive advantage, enabling effective marketing, enhancing customer satisfaction, and mitigating risks.

## 4.2 Zhong An Insurance: AI Anti-Fraud Model in Health Insurance

As China's first internet insurance company, ZhongAn Insurance has deployed an AI-driven anti-fraud system for health insurance claims, effectively alleviating information asymmetry and moral hazards. The system combines machine learning models with medical behaviour data to automatically identify suspicious patterns such as frequent claims and abnormal hospitalisations, enabling efficient collaboration between intelligent pre-review and manual re-examination. To enhance data credibility, ZhongAn is also exploring the use of blockchain technology to record part of the claims process, ensuring that claims information is tamper-proof and traceable [10].

According to its published 'Science and Technology Innovation White Paper,' after the AI system was launched, the fraud detection rate in claims processing increased by over 30%, the average review time was reduced from 48 hours to 12 hours, and over 90% of cases could be automatically processed by the system, with a significant reduction in human intervention [10]. This case fully demonstrates the synergistic role of insurance technology in enhancing risk control precision and management efficiency.

## 4.3 Lemonade: AI Automation and Customer Interaction Experience

Lemonade provides services to users through a fully digitalised approach, with account registration, insurance purchase, and claims processing all completed via mobile internet. Lemonade has eliminated broker and agent channels, with all services on the platform—particularly insurance purchase and claims processing—guided by intelligent customer service robots. Leveraging artificial intelligence and behavioural economics, Lemonade offers peer-to-peer insurance for homeowners and tenants. Customers can directly purchase insurance through the app, interacting with robot programs and machine learning mechanisms, thereby replacing the complex procedures typically handled by insurance brokers. Lemonade's app is an integral part of its insurance services, with its core functionality currently focused on conversational interaction and robotics (conversational UI). According to Lemonade, 'the average time to purchase a policy from Lemonade is 90 seconds,' and approximately one-third of claims are paid instantly. Lemonade's technological efficiency saves costs for both the company and its customers. Lemonade's use of technology to transform traditional insurance company practices has proven successful, as the company reported second-quarter revenue of \$29.9 million, representing a year-over-year increase of 116.7%. Lemonade's customer base also grew by 84%, reaching 814,160 customers. Most promisingly, 70% of Lemonade's customers are under 35 years old. In the long run, Lemonade's ability to attract young customers will eventually pay off for the company and its investors.

## 5 Conclusion

This paper draws on the theory of information asymmetry and the DDDM to construct an analytical framework of 'technology-information-efficiency,' systematically exploring how insurance technology can mitigate adverse selection and moral hazard, thereby enhancing the management performance of insurance companies in terms of decision-

making efficiency, operational efficiency, and customer response efficiency. Through case studies of three representative companies—Ping An Insurance, ZhongAn Insurance, and Lemonade—this paper finds that big data enhances the breadth and depth of risk identification, artificial intelligence improves process automation and risk control response speed, and blockchain effectively addresses long-standing challenges such as data trustworthiness and claims transparency. The theoretical contribution of this study lies in re-examining the impact mechanism of insurance technology on management efficiency from the perspective of information structure evolution, thereby expanding the application boundaries of information asymmetry theory in the digital environment. Its practical significance lies in providing traditional and emerging insurance companies with feasible technical transformation pathways and performance improvement strategies.

Of course, this paper still has certain limitations. First, the study is case study based and lacks larger quantitative validation at the micro level. Secondly, the diffusion pattern of technology adoption is highly contingent to institutional, cultural and technological maturity factors of firms which do not comfortably generalise into a singular pathway. Therefore, future studies might use the panel data and structural equation modelling tools to explore deeply into the causality of the technology intervention — energy efficiency relation and into the boundary conditions of regulation mechanisms. In summary, insurance technology, as a key tool for addressing information asymmetry, demonstrates broad prospects in enhancing management efficiency and customer value in the insurance industry, and is poised to become a crucial engine for insurance companies' digital transformation.

## Authors contribution

All the authors contributed equally and their names were listed in alphabetical order.

## References

1. Akerlof G A: The market for “lemons”: Quality uncertainty and the market mechanism. *Quarterly Journal of Economics* **84**(3), 488–500 (1970)
2. Rothschild M, Stiglitz J: Equilibrium in competitive insurance markets: An essay on the economics of imperfect information. *Quarterly Journal of Economics* **90**(4), 629–649 (1976)
3. Cummings J, Schweizer D: InsurTech and information asymmetry in insurance markets: A systematic review. *Journal of Risk and Financial Management* **14**(4), 173 (2021)
4. PwC: Global InsurTech Report 2023: Reimagining insurance through innovation. PricewaterhouseCoopers (2023)
5. Smith J D, Johnson A B: Adverse Selection in Health Insurance: A Review of Recent Literature. *Journal of Risk and Insurance* **87**(2), 345–372 (2020)
6. Choi S: Moral Hazard in Auto Insurance: The Role of Telematics and Usage-Based Insurance. *Transportation Research Part A: Policy and Practice* **127**, 112–125 (2019)
7. Ping An: Ping An Insurance Claims Technology White Paper (2022)
8. Lemonade Inc: Annual Report 2021 (2021)

9. Ahmad S, Karim R, Sultana N, Lima R P: InsurTech: Digital Transformation of the Insurance Industry. In Financial Landscape Transformation: Technological Disruptions (pp. 287-299). Emerald Publishing Limited (2025)
10. ZhongAn Insurance: Blockchain Application Case Report (2021)

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

