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Applying the Analytical Hierarchy Process to Exploring Demand and Technology Preferences in InsurTech: Focusing on Consumer Concerns †

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Abstract: By employing the analytic hierarchy process (AHP), we investigated consumer demand and preferences for InsurTech technologies. A survey was conducted with 350 respondents, yielding 348 completed questionnaires and achieving a response rate of 99.4%. After consistency checks, 78 invalid questionnaires were excluded, resulting in 270 valid responses, with an effective response rate of 77.3%. Using the Analytic Hierarchy Process (AHP), five critical dimensions were identified as top priorities for insurance companies implementing InsurTech solutions: (1) video insurance and mobile applications, (2) blockchain-based claims processing, (3) robo-advisors, (4) the Internet of Things (IoT), and (5) big data analytics. Video and mobile applications, along with blockchain, accounted for over 30% of the total importance of evaluating InsurTech technologies. Among the assessment criteria, "mobile applications" and "remote insurance" had the highest weights, highlighting their roles in the InsurTech service model. Insurance providers need to prioritize these two dimensions when designing their InsurTech service models to enhance service convenience and the customer experience.

Keywords: InsurTech; Internet of Things; blockchain; robot

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1. Introduction

The rapid advancement of digitalization and technology has enabled the emergence of InsurTech in the insurance industry. InsurTech encompasses technologies such as artificial intelligence (AI), blockchain, big data, and the Internet of Things (IoT). These innovative technologies transform the traditional operational models for insurance by reshaping the interactions between consumers and insurance companies. However, although technological advancements have introduced convenience and efficiency, consumer acceptance and preferences regarding these new technologies are uncertain.

Consumer acceptance of InsurTech is influenced by privacy concerns, trust in technology, and service usability [1]. For instance, privacy risks are a significant barrier to adopting blockchain-based insurance technologies, while usability and personalized services substantially enhance consumer acceptance [2]. One study highlighted that consumers weigh the convenience enabled by technological innovations against potential risks when selecting digital insurance products [3].These studies suggest that consumers need to understand their technological preferences to advance InsurTech adoption.

Nevertheless, the previous research has mainly focused on the development and application of technologies, with limited exploration of consumer needs, particularly in multi-criteria decision-making. There is a lack of systematic analyses of consumer demand and consumers' technological preferences. As a result, quantifying the priorities in consumer demand and understanding their preferences for various technologies need to be explored by academia and the industry.

Therefore, this study aims to address these gaps by employing the analytic hierarchy process (AHP) by exploring consumer concerns, consumer needs, and technological preferences in the application of InsurTech. The AHP is a structured decision-making tool that effectively analyzes multi-criteria decision problems and evaluates the relative importance of different attributes [4]. The AHP has been widely applied in consumer behavior and technology adoption studies, such as e-commerce service selection and digital payment system adoption to solve complex decision-making problems [5,6].

In this study, we identified the research criteria for constructing an AHP-based service development model for InsurTech through a literature review and analyzed consumer preferences for various InsurTech technologies and their relative importance.

2. A Literature Review

2.1. InsurTech and the Market

Digital technologies facilitate the rapid growth of the InsurTech market. According to Statista and Allied Market Research, the global InsurTech market exceeded USD 10 billion in 2023 and is expected to reach USD 40 billion by 2030, with a compound annual growth rate (CAGR) of over 16%. Key drivers of this growth include increasing consumer demand for personalized and real-time insurance services and the widespread adoption of advanced technologies such as artificial intelligence (AI), blockchain, and big data, as well as the digital transformation of traditional insurance companies.

Growing reliance on the Internet and the ubiquity of social media in modern society have rapidly transformed the insurance business model. Traditional labor-intensive service methods have been replaced by digital solutions to meet the increasingly diverse demands and expectations of consumers. This change has enabled the recent establishment of numerous innovative InsurTech companies.

For instance, Lemonade, founded in New York in 2015, emphasizes the customer experience by offering a fully contactless process for insurance plan purchases and claims through its mobile application (app) to ensure efficiency and convenience. Oscar, backed by Google's parent company, leverages healthcare big data to provide user-friendly, personalized, and transparent pricing and claims solutions for consumers. Meanwhile, Next Insurance, also based in the U.S., targets small businesses and freelancers by offering a wide range of insurance products tailored to diverse needs.

In Taiwan, the COVID-19 pandemic has driven the insurance industry to actively promote video-based insurance services as a key strategy to address the issues caused by social distancing policies and limitations on in-person interactions. Video insurance allows consumers to complete the insurance purchase process remotely through online meetings or video calls. There was surging demand for this service during the pandemic, highlighting its potential as a critical tool for ensuring business continuity in times of crisis.

2.2. The Dimensions Affecting InsurTech

The development of InsurTech has been extensively researched by scholars and institutions. According to a report by PWC, the expansion of InsurTech was disrupted by traditional insurance operations, prompting companies to rethink their business models. They identified key trends in InsurTech including mobility, big data analytics, distribution

channels, the IoT, and blockchain. The integration of these technologies enables insurance products to become more personalized and address customer needs better [7].

2.2.1. Video Insurance and Mobile Applications

Video insurance and mobile applications are widely applied for policy purchasing, claims processing, customer service, and educational training [7]. Consumers can use mobile apps to compare products, submit claims, and access product explanations or real-time customer support via video functionality, significantly enhancing convenience and interactivity. Mobile apps streamline transaction processes, reduce service times, and utilize data collection and analysis to optimize product design and adapt to market demands [1]. Video functionalities boost customer engagement and foster brand loyalty. During the COVID-19 pandemic, Taiwan's insurance industry rapidly adopted video-based insurance services to address the social distancing requirements. As a pivotal application of InsurTech, video insurance and mobile apps improve customer experiences by offering insurers competitive advantages and innovation opportunities.

2.2.2. IoT

The IoT enables real-time data collection and analysis, allowing insurers to create precise risk profiles [8]. Smart sensors and embedded devices provide unprecedented precision in risk monitoring, ranging from tracking driving behavior through in-vehicle devices to risk alerts via home safety sensors [9]. These advancements transform the traditional pricing models and shift the insurance paradigm from reactive claims processing to proactive risk management. IoT technologies significantly reduce insurers' claims costs while offering customers more personalized services. Through real-time data analysis, insurers need to accurately assess the individual and corporate risks, facilitating fairer and more dynamic premium pricing strategies.

2.2.3. Big Data Analytics

Big data analytics has become a critical tool for understanding consumer behavior in modern enterprises. Integrating multi-source data enables businesses to build precise consumer profiles and predictive behavior models [10]. Data sources include social media interactions, purchase records, browsing behavior, and geographic locations, analyzed using machine learning and AI algorithms. Big data are used to predict current consumer needs and predict future trends through historical data patterns. Predictive analytics allows companies to adjust their product strategies, enhance customer experiences, and deliver personalized services, ultimately boosting their market competitiveness and customer satisfaction. By leveraging real-time data processing and predictive modeling, insurers can understand and respond to consumers' dynamic demands better.

2.2.4. Blockchain

Blockchain technology offers transformative solutions for the insurance claims process. Blockchain ensures transaction immutability and transparency, significantly reducing the risk of insurance fraud [11]. Smart contracts, enabled by blockchain, can automate claims processes, minimizing manual intervention and reducing processing times. The decentralized nature of blockchain ensures the security and traceability of transaction records, enabling insurers to establish efficient and transparent claims mechanisms.

2.2.5. Chatbots and Robo-Advisors

AI-driven chatbots provide real-time customer support all the time, significantly enhancing service efficiency and satisfaction [10]. They noted that these intelligent systems, utilizing natural language processing (NLP) and machine learning technologies, accurately

understand customer needs and offer personalized financial advice and insurance solutions [12]. Machine learning enables the personalization of financial recommendations, which reduces the workload of human advisors with faster and more precise financial planning for customers.

Video insurance and mobile applications, IoT, big data analytics, blockchain, and chatbots/robo-advisors illustrate how InsurTech is reshaping the insurance industry. By leveraging these technologies, insurers can enhance their efficiency, improve customer experiences, and drive innovation in an increasingly competitive market.

3. Methodology

3.1. Data Collection

The Analytic Hierarchy Process (AHP) was applied in a questionnaire survey conducted among insurance policyholders. The survey was conducted from March to April 2024, with 350 questionnaires distributed and 348 responses collected, achieving a response rate of 99.4%. Following a rigorous consistency check, 78 invalid questionnaires were excluded, resulting in 270 valid responses, with an effective rate of 77.3%.

The respondents included 148 males and 122 females, while 70 respondents were at the age of 20−30 years old, 104 were 31–40 years old, 60 were 41–50 years old, and 36 were older than 50 years old. A total of 64 of the respondents had graduated from high school or vocational college, while 142 had graduated from college, and 64 had MS degrees or Ph.Ds. A total of 169 respondents were employees, 50 were self-employed, 26 were retirees, and 25 were students. Of the respondents, 34 had been insured for less than 1 year, while 78 had been insured for 1–3 years, 68 for 3–5 years, and 90 for more than 5 years.

A questionnaire was designed to determine the heterogeneity among policyholders and ensure the representativeness of the sample, employing a stratified random sampling method. The consistency index (CI) and consistency ratio (CR) were tested. The threshold for the CI was 0.1 to ensure the consistency and reliability of the questionnaire results.

3.2. AHP Application Procedure

Using the AHP, the consumer demand and technology preferences for InsurTech were analyzed within a structured and scientific analytical framework. We decomposed the research objectives into a hierarchical structure at the goal, criteria, and indicator levels. Through pairwise comparisons by experts and consumers, a hierarchical matrix was established, and weights were assigned to each indicator. The weights were calculated using the eigenvalue method, and the consistency ratio (CR) was tested to ensure the reliability of the results of the analysis. In InsurTech research, the AHP is used to systematically evaluate consumer preferences in multiple dimensions, such as technological innovation, personalized services, privacy protection, and economic benefits. The AHP is used to quantitatively identify influencing dimensions for the design and strategy development of InsurTech products, with significant academic and practical value. We identified five dimensions in the criteria presented in Table 1.

Table 1. Dimensions and criteria content of InsurTech.

Factor	Criteria
Video insurance and mobile apps	Enhance user experience through mobile apps for insurance purchasing and claims processing.
Internet of Things (IoT)	Utilize IoT technology to collect data and implement smart insurance solutions.
Big data	Apply big data analytics to predict consumer needs and behaviors.
Blockchain	Enhance transaction transparency and security through blockchain technology.
Chat-bots/robo-advisors	Provide automated customer service and financial planning tools to improve customer interactions.

These criteria presented dimensions that consumers prioritized in the implementation of InsurTech solutions, serving as a reference for insurance companies in promoting technological innovation.

1. The main criteria

The main criteria identified in this study included technological innovation, customer needs, business process optimization, and information security. These criteria play a crucial role in the development of InsurTech services.

2. Weights

According to expert evaluations, technological innovation was considered the most important criterion, followed by customer needs and business process optimization. This indicates that insurance companies must prioritize technological innovation and actual customer needs when promoting technological services.

3. Model construction

We established an AHP-based development model for InsurTech services. This model reflected the current trends in InsurTech development and provided a decision-making basis for companies during their transformation process.

4. Results and Discussion

In the five dimensions of the InsurTech service model, video insurance and app applications were more significant, with a weight of 0.311, indicating that digital services were essential in modern InsurTech. Blockchain's weight was 0.305, reflecting the importance of technology in enhancing the transparency and efficiency of insurance processes. Robo-advisors showed a weight of 0.238, highlighting the critical role of intelligent customer service in the development of InsurTech. Although the Internet of Things (IoT) and big data had lower weights of 0.100 and 0.053, respectively, they were indispensable to insurance technology. The CI was 0.00748 and the CR was 0.00668, indicating that the dimensions and their weights showed consistency and reliability.

Among the evaluation criteria, mobile apps and remote insurance had the highest weight of 0.311, indicating their importance in the InsurTech service model. Therefore, insurance companies must prioritize these two factors when constructing their InsurTech service models to enhance service convenience and customer experience. Claims on mobile phones and fraud prevention's weight was 0.305, highlighting the importance of efficiency and security in the claims process as key factors in the InsurTech service model.

Insurance planning and financial planning were weighted at 0.238, showing their significant role in the InsurTech service model, particularly in providing personalized and comprehensive insurance and financial advice. Smart home insurance and smart health insurance were weighted at 0.100, indicating that these criteria were secondary in the InsurTech service model. However, their importance has increased with the development

of IoT technology. Spillover insurance and usage-based insurance (UBI) showed the lowest weights, at 0.053, indicating their relatively minor influence in the current model. The details are shown in Table 2.

Table 2. Weight of InsurTech service model dimensions.

Dimension	Overall Weight	Criteria	Rank
Video Insurance and Apps Applications	0.311	Mobile Apps	1
		Remote Insurance	5
Blockchain Claims	0.305	Mobile Claims	2
		Fraud Prevention	6
Robo-Advior	0.238	Insurance Planning	3
		Financial Planning	4
The Internet of Things (IoT)	0.1	Smart Home Insurance	7
		Smart Health Insurance	8
Big Data	0.053	Overflow Insurance	9
		UBI	10

Such results suggested that insurance companies must develop mobile applications and remote services while ensuring the efficiency and security of the claims process to meet customer needs and improve service quality.

5. Conclusions

We investigated the consumer demand and technology preferences for InsurTech using the AHP. Digital services are essential to modern InsurTech. Specifically, video insurance and mobile applications showed critical roles in enhancing service convenience and customer experience. The importance of blockchain technology in improving the transparency and efficiency of insurance processes was also confirmed. Robo-advisors have played a key role in intelligent customer service in the development of InsurTech. Although the weights of IoT and big data were low, they provided indispensable supportive functions. Insurance companies must develop video insurance and mobile applications to enhance service convenience and customer experiences to meet the needs of modern consumers and increase their market competitiveness. Blockchain technology has significant potential to improve the transparency and efficiency of insurance processes. Insurance companies must apply blockchain technology to enhance the transparency and security of the claims process. As robo-advisors have provided personalized and intelligent services, insurance companies need to increase their investments in developing robo-advisors to enhance the level of intelligent customer service. Although IoT and big data were less highly weighted, their supportive roles in the InsurTech service model must be acknowledged. Insurance companies need to integrate these technologies into existing services to improve risk management and customer analysis capabilities.

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