

Artificial Intelligence in Insurance Sector

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Abstract:- The aim of this research is to understand better the Use-cases of Artificial Intelligence(AI) in the Insurance Sector. Particularly, we want to explore the scope and market penetration of AI in insurance services to overcome ongoing problems for better customer satisfaction in the hospitality industry. Based on the concepts of AI, a conceptual model was developed. The conceptual model intends to measure the relationship between AI & its use cases in the Insurance industry. An empirical quantitative research was used to verify the model, with a sample of international companies and InsureTechs Implementing such models. This research concludes some practical insights that are believed to be very useful for Insurance companies when responding to dissatisfied customers and other operational troubles.

I. INTRODUCTION:

Insurance has been an industry with low customer engagement. Consumers interact less with insurers than with any other industry in the study¹. Many insurers have limited interaction with a significant portion of the end-consumers because a considerable amount of their business is intermediate—brokers, for instance, amass got an impressive \$45 billion in annual compensation from insurers around the world². Furthermore, the slow digitization of the industry that insurers have fewer opportunities to gain insight into customer needs and to use insights to customize products.

Major Problems in the industry lies in six verticals:

- Opportunity Cost: Reaching out to prospective customers at the right time
- Right Advice: Providing the right set of products that suit customer requirements
- Time Consuming: Fastest claim support to loyal customers
- Cost: High-cost claims taking the edge of firms to make them get marginal profit
- Frauds: Increasing number of False Claims and fraudulent
- Bulky operations: Large data is being processed manually making operations bulky

These 6 verticals can be taken up and tackled efficiently using tech. Cognitive technologies growing these days has developed its own intelligence pacing up the insurance industry to a remarkable speed. In this research, we will look towards the Uses, Influential Factors, Major Benefits, Major Challenges, Ethical Aspects & future scope of integrating AI in Insurance Sector. Also, we will look towards the impact on marketing volume and expenditure of the company pre and post-AI implementation.

Artificial intelligence (AI) is a burgeoning technology, industry, and field of study. Considering the level of widespread adoption and emerging new techniques, AI applications boast impressive efficacy across industries, particularly in Marketing and Finance. AI has the potential of changing and improving every day based on the judgements made yesterday. It keeps on learning from the humongous data available to it. By 2020, there will be around 40 trillion gigabytes of data (40 zettabytes)³.

II. LITERATURE REVIEW:

I. Artificial Intelligence (AI):

Artificial Intelligence (AI) is a computer-assisted analytical course that attempts to form automated systems which can be referred to as intelligent. The level of intelligence can be set-up to a threshold value to further categorize it into Weak, Strong and Super Intelligent AI⁴.

- Weak AI, i.e. Artificial Narrow Intelligence (ANI), which works on something which is specific
- Strong AI, i.e. Artificial General Intelligence (AGI), which mimics human-level intelligence.
- Super Intelligent AI (ASI)⁵, which is capable of creative and scientific thinking, exceeding human-level intelligence.

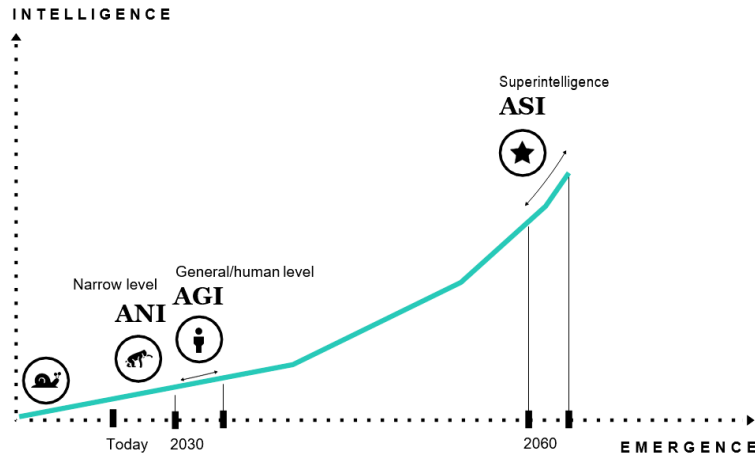


Fig1. How smart is Artificial Intelligence?⁶

AI Model interacts with the environment in a repetitive cycle of sense-think-and-act. It takes in the data from the environment, makes an informed decision based on the input data and past experience, and finally performs an action affecting the environment. It takes the data in the form of images, videos, sound, text etc., analyses this data using AI algorithms and delivers AI-powered solutions.



Fig2. Sense-Think-Act process followed by an intelligent agent⁷

II. Insurance and AI:

In 2017, Artificial Intelligence has shown its substance in various business verticals by rapidly creating controlled, digitally enhanced automated environments for maximum productivity. Apparently, Insurance companies, in particular, have a lot to gain from investing in AI-enabled technology that can not only automate the scheduling of executive-level tasks but can also enrich service quality by helping agents make right decisions and irrefutable judgments⁸.

AI is growing due to the ever-increasing “datafication” of business interactions, private life, and public life. In the age of digitalization, more and more data is being collected – by organizations, governments, households, and individuals. Approx. 2.5M terabytes of data are created every day.⁹

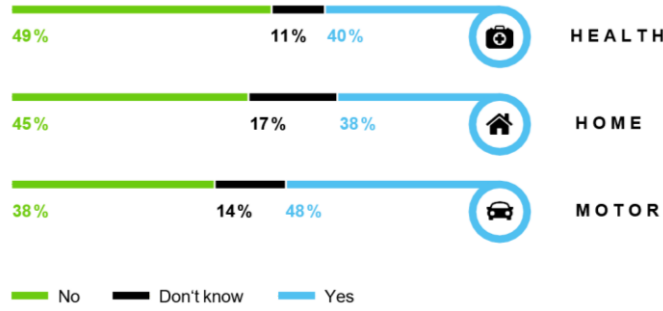


Fig 3. Proportion of customers willing to track their behavior and share data with insurers for more accurate premium¹⁰

With the increasing amount of valuable customer data, Insurance giants are majorly investing in AI and cognitive technologies with an estimated overall spend of USD 4.8B in 2016¹¹ to a projected spend of USD 47B by 2020¹². We have three segments where insurers are focusing on AI implementation:

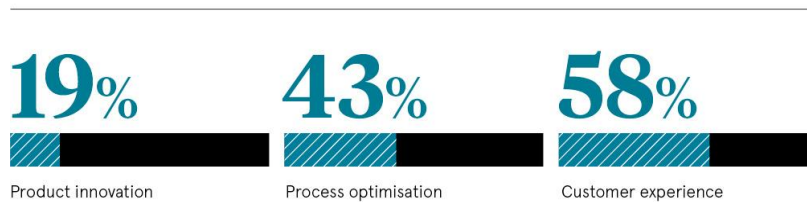


Fig 4. Where Insurers are focusing on AI Implementation¹³

III. Insurance Case Studies:

The case studies below represent some of the ways (re)insurers are working with technology companies to embed AI into their businesses. However, the application of AI and machine learning in the insurance space is relatively new, and most of the initiatives are primarily testing pilots with several projects yet to be up scaled and introduced to the market. While the insurance sector has just scratched the surface in leveraging AI, many pilots have been big success stories in the insurance community. The case studies we have included in this report don't exclusively represent insurers that are deploying AI. However, our objective is to show how insurance companies are deploying AI to achieve business objectives.

A. AXA and Google TensorFlow

About 7–10% of AXA Japan's customers cause a car accident every year. Most of these are small accidents with low insurance payments, but about 1% are so-called "large-loss" cases where the insurance payments are more than \$10,000. Due to this potential for large payouts, AXA turned to Google TensorFlow to build deep neural networks to analyze large amounts of customer data to predict potential losses, in order to optimize prices for their motor insurance policies.

Benefits: The AXA team has achieved an accuracy rate of 78% in its predictions. This provides AXA with useful applications to achieve higher profits, including creating new insurance services such as real-time pricing at the point of sale.

B. Fukoku Life Insurance & IBM Watson

Fukoku Mutual is a Japanese life insurer which, like other insurance companies, grapples with inefficiencies in claims processing and the rising cost of operations. In February 2017, the insurer began to leverage IBM Watson Explorer to introduce an AI application that will automate the claims process and calculate claims pay-outs accurately, based on a number of elements such as administration procedure, length of hospital stay, medical records, and others.

Benefits: Fukoku is already witnessing improvement in its operational efficiency in medical claims processing, such as preventing payment oversight and reducing the cost of labor. The insurer increased its productivity by 30% and achieved

improvement in the accuracy of payouts. It anticipates a return on investment within the next two years and aims to increase customer satisfaction through reduced time for claims pay-outs.

C. Transamerica and H2O.ai

Transamerica is a US-based insurance company whose offerings include insurance, annuities, and retirement products. It services 27 million customers. The insurer has a large amount of accumulated customer data, which it realizes can be fully leveraged to buffer the top line by exploiting opportunities to cross- and up-sell while improving customer service and satisfaction. Transamerica built a large data stack on Hadoop and collected data from different systems such as CRM data, customer data, and third-party data. It used H2O.ai machine learning, an open-source, to harness the data.

Benefits: Using H2O machine learning, the Transamerica team was able to obtain better customer intelligence for improved marketing campaigns to current and new customers, improved product recommendations, and more effective cross- and up-selling, which has been reflected in improved customer service and increased revenue streams along with future innovation across the company.

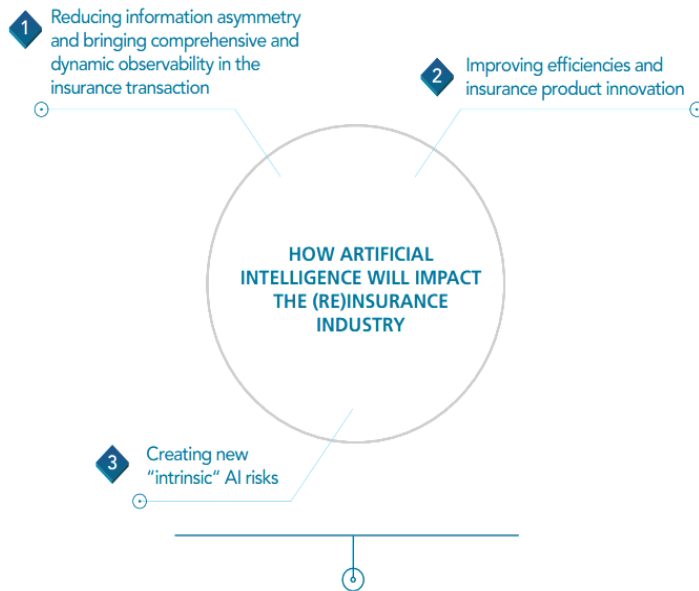


Fig 5. The Impact of AI on the (Re)Insurance Industry will be Three-Fold¹⁴

III. METHODOLOGY:

I. Key AI Technologies/Pre-Trained AI Models:

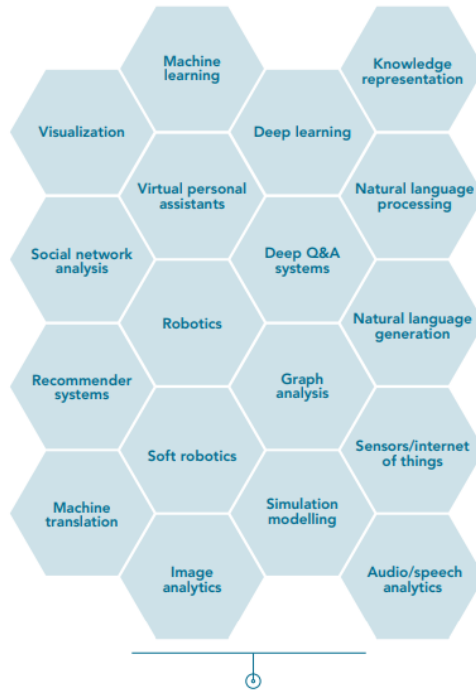


Fig 6. Main Research Fields Encompassed by AI¹⁴

A. Machine Learning:

Machine learning is a subset of AI that uses computer programs to learn and improve upon themselves without explicit coding and process large amounts of data. In most cases, a set of training data is used to teach the ML system how to identify the correct output for a given input improving continuously.

This type of technique is optimum to recognize the behavior of customers and their risk factors.

B. Smart Robots:

Smart Robotic Process Automation with AI solution allows you to automate business processes rapidly. Insurers regularly handle an exceptionally high volume of business processes like claims processing and underwriting as well as providing policy quotes manually which creates delay and also affects customer satisfaction, business conversion and profitability.

Robotic process automation utilizes intelligent robots known as virtual workforce (or bots) which can interact with software applications like ERP systems, service desks, databases and other business applications¹⁵.

C. Object Recognition:

Object recognition is a part of computer vision and a process to identify and detect an object or attribute in a digital video or image. Object recognition can vastly improve how marketers understand, track & interact with and understand consumers at scale in a way that works congruently to their lives. The image recognition market is estimated to grow from USD 15.95 Billion in 2016 to USD 38.92 Billion by 2021¹⁶, at a CAGR of 19.5% between 2016 and 2021.

It is best used for Real-time car damage assessment, Use satellite images for agricultural insurance pricing, Radiological imaging diagnostics, Risk modelling with image data etc¹⁷.

D. Recommendation Engines:

Recommendation engines are used in a wide variety of applications. Applications have differing temporal dynamics or volatility, amount of available data, the use of explicit or implicit indicators, etc. It interprets results and recommends appropriate actions.

This technique is used for policy recommendations, personalized optimal term plans, Upselling & Cross-selling i.e. targeted campaigning tailored for each user¹⁸ etc.

E. Natural Language Processing:

A subfield of AI focused on the understanding of human language. NLP often uses machine learning algorithms and allows computers to understand the hierarchical structure of language and how components of a sentence relate to each other (Jurafsky & Martin, 2014). NLP lets computers understand the complexities of human language that influence a sentence's meaning.

The advent of NLP has led to a wide range of practical applications, such as chatbots, converting speech to text, correcting grammar, the ability to identify the sentiment of a string of text, and much more.

F. Virtual Assistants:

Virtual assistance or digital concierge services can conduct conversations with humans in natural language to accomplish tasks such as assisting customers with answering questions that are relevant to insurance, guiding them on the purchase of simple insurance products, or conducting transactions

G. Context Awareness:

Context-aware technology detects relevant information and adapt in order to improve an interaction. It does this by applying rules around time, event, location, or other context provided by the environment in which it executes. It anticipates a changing situation or an emerging need and trigger the right response at the precise time. Context-Aware Umbrella technologies - Anonymous video analytics (AVA), Augmented reality (AR), Beacons, Biometrics (Facial recognition, Fingerprint recognition, Voice authentication) etc¹⁹.

Implementations as Detection of false policy claims & frauds, Modern customer communications management (CCM), Mobile marketing i.e. selling policies & insurances online, Smart digital signage (threat detection in retail stores), Hassle-free access to the customer policy info & claiming details etc.

H. Predictive Analytics APIs:

Predictive analytics is a variety of statistical and analytical techniques used to develop models that predict future events or behaviors. The form of these predictive models varies, depending on the behavior or event that they are predicting. Most predictive models generate a score (a credit score, for example), with a higher score indicating a higher likelihood of the given behavior or event occurring. Ex- Social Credit Score for Loan issuance.

This type of model is used to market products based on purchasing patterns, underwriting to filter applicants not meeting pre-determined model score, Detect fraudulent Claims etc.

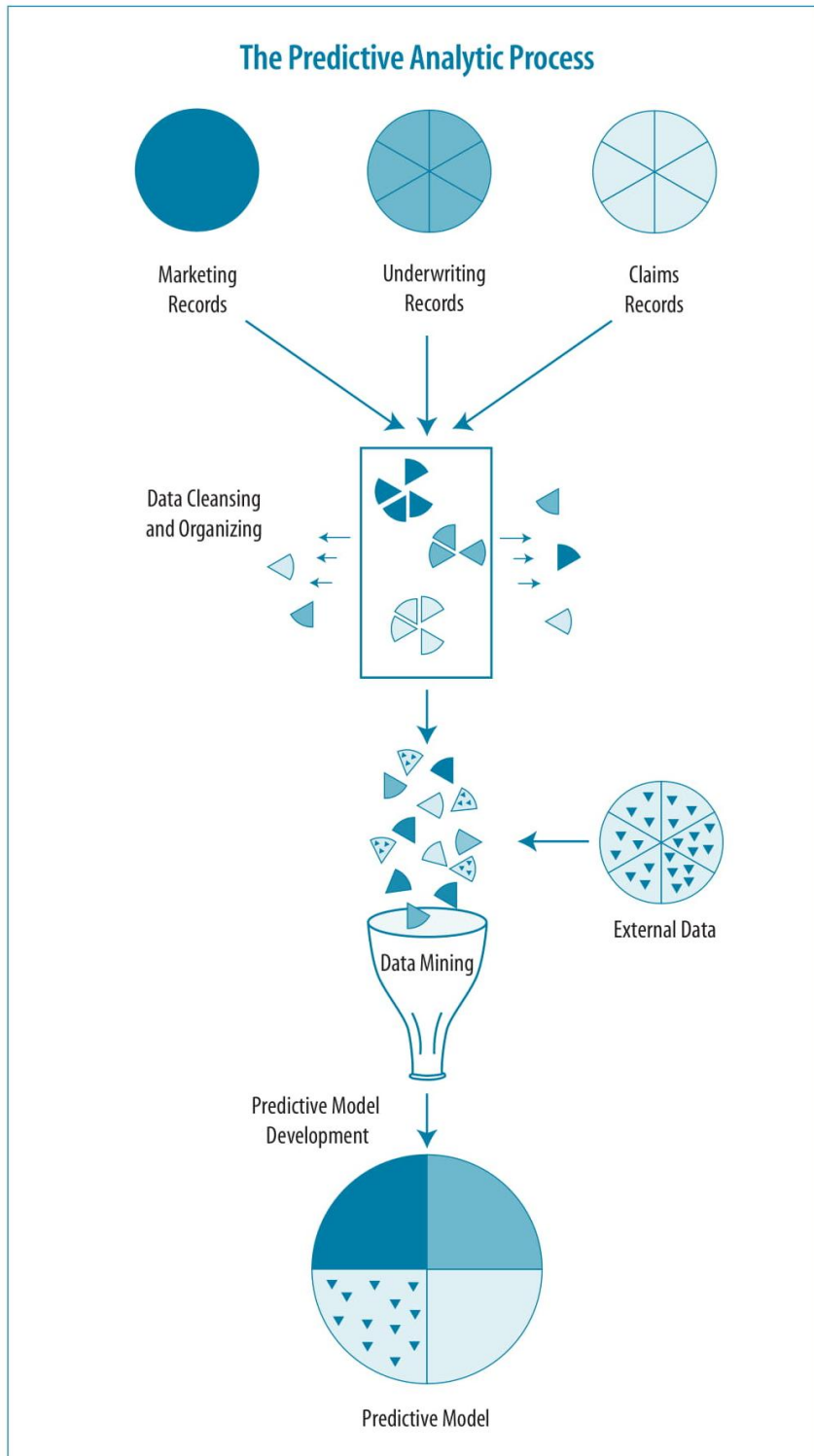


Fig 7. The Predictive Analytic Process²⁰

AI offers the opportunity to drive more personalized services, advertising, and marketing campaigns. So insurers can integrate proprietary data and new sources of data from digital & social media and from sensors & connected devices. Thus, more tailored experiences can be created by identifying customer segments for personalization utilizing cluster analysis of feedback. Personalization can increase insurance companies' profits by 5–10% (Deloitte). Learning from the retail industry, insurers can use machine-learning algorithms to develop complex models to optimize customer lifetime value and increase opportunities for cross-selling and product recommendation.

Ex - Transamerica and USAA are using machine learning and recommendation engines to obtain better customer intelligence for improved marketing campaigns to current and new customers, improved product recommendations, and more effective cross- and up-selling. Insurance companies get benefit from rich contextualized customer data optimizing customer lifetime value through product recommendation.

C. Improving the customer experience

To overcome slow insurance procedures especially in property and casualty, in 2017, insurers invested in AI to improve operational efficiency by automating claims processing and customer engagement/servicing (Chatbots). Virtual assistant can assist customers with Doubts, Purchases & Transactions in natural language. Robo-advice (Chatbots) has potential in low-middle wealth segment & youth because of low pricing, understanding of consumer behavior & optimum advice. Also this can be used to offer 'beyond-insurance' coverage and value added services like data-enabled healthy lifestyle, fitness & driving habit advice using IoT & AI.

Ex - AIG achieved an investment boost of \$244bn in its retirement units, LV= (a UK-based retirement mutual insurer) invested £10m in the robo-advisor Wealth Wizards in 2017 and launched a robo-Para planner, tool that provides retirement advice in less than two hours making investment advice process easier. Department of Labor's Fiduciary Rule in the US, imposed a sales compensation model restructure resulting in some financial advisors pulling back encouraging adoption of robo-advice. South African insurtech Vitality, offers wearables including Fitbit watch with health insurance policy and a fitness program that includes a 50% discount on gym membership and uses customer health data to effectively provide advice on a customer's lifestyle.

D. Automating and improving the claims process

Major pain point i.e. untimely processing and customer dissatisfaction in claim processing again can have helping hand as AI. It can be used to provide better communication through intelligent automation. We can extract predictions for claims based on information available, assign complex claims to experienced adjusters, track claims leakage from audit process (via claim investigation, evaluation, and settlement).

Ex - In 2017, AI was used for triaging claims based on the assessment of images. After viewing images of vehicle damage, AI Approval makes an assessment within seconds, reviewing and authorizing Repair estimates, ensuring reliability and speed throughout the claims process.

E. Improving the underwriting process

High Operational costs and low profitability maintenance from process issues have difficulties around manual data generation, collection & processing from underwriters and brokers with inundated paper files. AI can be used to analyze different types and volumes of data in a shorter time helping with redundant incompatible legacy systems clunky-scattered, disparate data. This can reduce cost, time, entry errors, poor-pricing decisions and underwriting processes. Good pricing model incorporates different types of information and variables to differentiate the risk and price it accurately, to outperform competitors and avoid adverse selection of risk.

Ex - AIG has been exceptionally proactive in applying the lessons of the past and moving to place data and analytics at the heart of its SME underwriting division. Recently, in partnership with Hamilton USA, AIG launched Attune, an automated, highly data-driven platform based on AI.

F. Optimizing risk pricing

Price optimization is one of the greatest benefits that AI and ML can offer to the insurance sector's profitability by refining pricing models through data generated from next-generation telematics. Most efficient & reliable techniques are solely based on statistics methods such as General Linear Models (GLMs) which continually analyze large structured and unstructured data factoring different variables. It can build tools on top of these model for non-technical users (e.g. underwriters), combined with recommendation engine to enable prescriptive analytics. Its best suited for delivery of clearer understanding towards risk, operational resilience, and improved customer interactions, in particular from the underwriting and pricing purview.

Ex - IBM, Microsoft, and Amazon's AI front is yet to fully materialize. IBM's Watson is well embedded in the vernacular and yet to launch the full breadth of services across the insurance vertical. Many insurtechs are innovating in the domain of contextualized predictive algorithms coupled with industry data consortiums, which addresses one of the weakest operational areas among many established giant tech providers. It can also accelerate GTM strategies and provide enhanced services.

G. Fighting insurance fraud

In Property and casualty insurance industry, fraudulent claims continue to be a sore point. AI has the capability of detecting anomalies in insurance claims by suggesting fraud based on patterns of claims, customer interaction and behavior. ML can be optimal to identify those that warrant deeper investigation.

Ex - In the US, losses from fraudulent claims are estimated at \$30bn annually, and US insurers are paying between \$5.6bn and \$7.7bn in excess motor injury claims. Fraudulent claims are also a growing problem in the UK and elsewhere.

H. Shifting cyber insurance to solutions

Cyber Insurance is growing field with coverage type going up by 36% in 2016 (Aon). AI can have huge implementation in this sector from predicting risk more accurately than actuary to understanding the new vulnerabilities in the system infrastructure and processes. Cybersecurity startups can help insurers to underwrite cyber policies by offering cyber liability rating. This will increase Cyber Insurance penetration while bolstering insurers' capabilities in this remit.

Ex - BitSight builds cyber risk model based on multi-sourced data with breaches and assessment of companies' infrastructures to help insurance companies understand vulnerabilities in the system infrastructure and processes. BitSight monitors user behavior. In 2018 Cisco, Apple, Allianz, and Aon teamed up to develop more sophisticated cybersecurity insurance solutions that combine coverage, prevention, detection, and response.

I. Quantifying the risk of autonomous vehicles

Motor Insurance for AVs (Autonomous Vehicles) predicted 60% drop due to increased safety, automation, alerts, and crash avoidance systems (KPMG). Now instead of vehicles software failure, manufacturing defects, and cyber risks will be insured further leveraging AI for risk prevention. How massive data current statistical models can't work so we need to introduce AI to underwrite, assess the risk & future development of AVs.

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Ex - XL Catlin, one of the largest specialist insurers, is involved in DRIVEN, a joint consortium led by Oxbotica, an Oxford-based company that specializes in AI. AXA is involved in a British government-funded autonomous vehicle initiative. However, data ownership is still controversial and needs new agreements possibly facilitated by regulators.

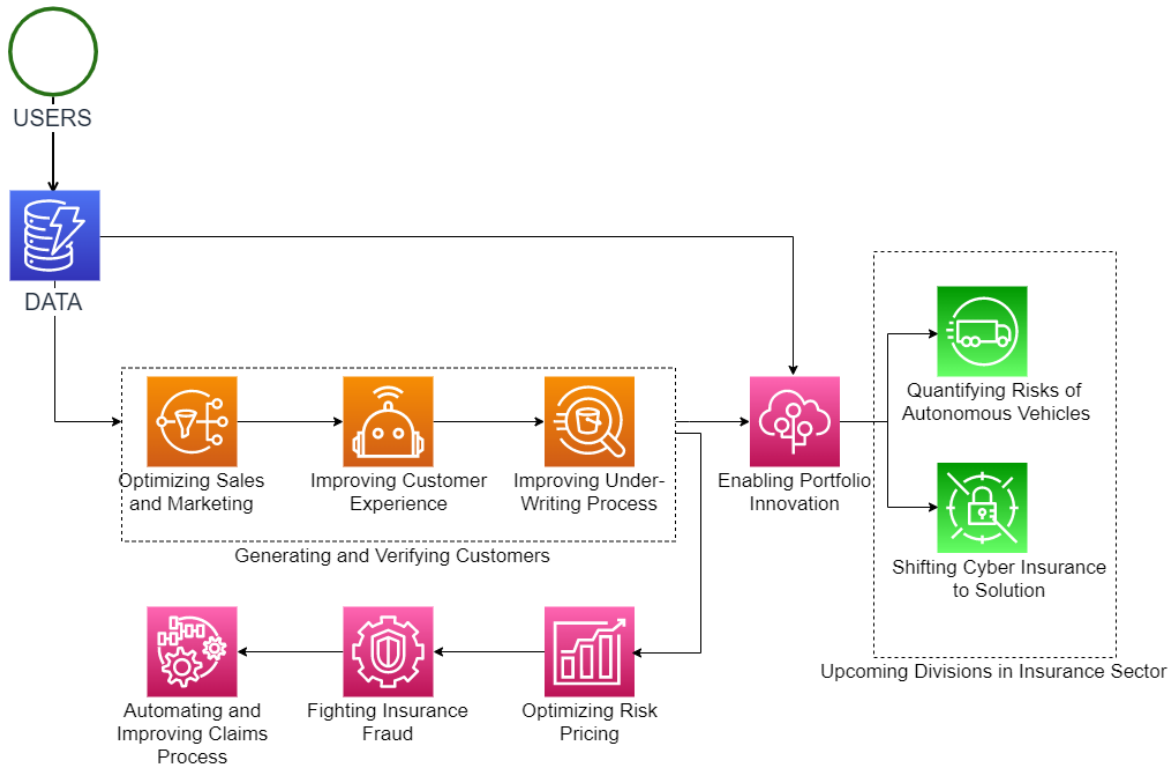


Fig 9. Proof of Concept(POC): Use-Cases of AI technologies

IV. IMPLEMENTATIONS:

Corporate Implementations:

The companies listed below are insurance companies at the forefront of machine-learning technology that will be heavily dependent on their AI prowess to grow over the next decade. The AI investment theme is expected to have a positive earnings impact on these companies.

Company(Country)	Competitive position in the 'AI' theme
Ageas(UK)	Motor insurance claims using image recognition technologies developed with AI specialist insurtech Tractable. Provides notification of loss, estimate of loss to payouts without human interaction in a few minutes.
AIG(US)	AIG with Hamilton & Two Sigma created Attune, making customer experience smoother and facilitating underwriting. AIG introduced a robo-advisor in annuity segment called Valic to streamline operations and increase profitability.
Allstate(US)	Allstate assess property loss using drones and AI. Aerial images use AI image recognition to determine losses. Allstate Cognitive Automation Incubator (ACAI) experiments with AI, ML, robotic process, chatbots, and NLP.
Aviva(Canada)	Aviva with Screenshot provide virtual claims platform technology for its personal and commercial insurance segments. In pilot program, 93% of Aviva customers choose to utilize the virtual claims platform for 20-40% faster claims.
AXA(Hong Kong)	AXA has shifted insurance business to prevention by strategic investments in

	start-ups. It has invested in Neura, a company that utilizes deep learning to create digital identity profiles for customers.
Lemonade(US)	Lemonade offers homeowners' and renters' insurance powered by AI with license. It has combined claims algorithms, 18 anti-fraud algorithms, and a chatbot, Jim. Lemonade has 13 investors, including Google Ventures & Allianz.
Liberty Mutual(US)	Liberty Mutual in 2017 developed an app with AI capabilities to improve driver safety integrating company & open data (Ex- government, weather). LM created its venture capital arm, Strategic Ventures, to invest in AI-led insurtechs.
Swiss Re(Switzerland)	In 2015 the Swiss reinsurer utilized the IBM Watson platform to develop solutions for its life and health underwriting division, to obtain better insight from big data. Ex- predicting an applicant's smoking propensity without fluid-testing.
USAA(US)	USAA used AI for personalized cross-selling and up-selling. USAA with Google TensorFlow developed ML models and with Google Advance Solutions Lab built a range of skills specific to its insurance needs.
Zurich(UK)	Zurich has partnered with SPIXII to launch a chatbot called 'Zara' to automate claims processing in its motor and home insurance segments. This investment will deliver better value to Zurich's insurance customers and improve efficiency.

V. CONCLUSION:

AI can help in the above shown ways for better customer satisfaction, profits & reducing frauds, effective time and operational complexities. Proof of Concept has use cases of AI backed by corporate examples thus showing the huge perspective of development in the insurance industry.

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