

Artificial intelligence impact on the insurance industry: the Unipol Group S.p.A. case

Alessandra Arcuri, Martina Mazzotti, Melissa Mattioli

Abstract—This paper provides an in-depth exploration of the insurance industry, with a particular focus on the transformative impact of artificial intelligence. The study begins by examining the fundamental aspects of the insurance sector, including the various types of policies and the historical evolution of the insurance market. It then delves into the Insurtech landscape, offering insights into the industry’s classification, innovative strategies, and game-changing technologies.

Within the game-changing technologies, a significant portion of the paper is dedicated to the role of Artificial Intelligence (AI) in the insurance field. The analysis covers the drivers of AI adoption, the implementation of Narrow AI, and presents real-world use cases. The benefits and potential risks associated with integrating AI in insurance operations are thoroughly discussed, along with the challenges and opportunities that insurers may encounter.

To provide a practical perspective, the paper includes a case study on Unipol Group S.p.A., examining its presence in the insurance, financial, and real estate sectors.

The paper concludes with reflections on the future trajectory of the insurance industry, considering the ongoing innovations and challenges. By synthesizing theoretical insights with a concrete case study, this paper contributes to a holistic understanding of the evolving dynamics within the insurance sector, emphasizing the pivotal role of Insurtech in shaping its future landscape.

I. THE INSURANCE INDUSTRY

By offering a variety of risk protection services, including asset protection insurance for property damage caused to third parties, pension products, and life insurance coverage, the insurance business significantly contributes to the economy and society. Insurance is a must for enterprises and productive activities: it facilitates risk transfer, enabling enterprises to access affordable credits and providing safeguards against risks linked with business expansion into new markets, products, and services. These components are pivotal for generating value and fostering economic growth.

In addition to the business sphere, insurance is crucial for people as well. It represents a relevant prerequisite for well-being and financial stability since a lack of insurance coverage would leave people and families unprotected from unpredictable events of daily life. Moreover, it’s important to remember that the insurance market is a significant source of private savings, particularly when it comes to retirement planning.

Insurance can be described as ‘a contract whereby the insurer, towards the payment of a premium, is obliged to reimburse the insured party, within the agreed limits, for the damage caused to him by a claim, or to pay a capital or an annuity on the occurrence of an event pertaining to human life’ [11].

The insurance contract is an agreement wherein one party assumes the risk of a causal event affecting the content of its contractual performance in exchange for a fixed counter-performance, the premium, with which a subject insures himself against certain detrimental financial consequences dividing them among a plurality of subjects exposed to the same risk.

1.1 Types of policies

Insurance plans can be divided into classes or branches that cover related risks. Each branch offers various methods for managing the insurance form, as well as general and specific conditions and principles. The “non-life branch” and the “life branch” are the two primary categories of distinction.

Non-life insurance

These plans defend the insured against occurrences that could harm specific assets (like a home or automobile), the insured’s earning capacity, the insured’s overall assets, or the insured as a person. The primary non-life insurance policies are described below:

- **Property damage:** includes protection against all occurrences that could cause damage to houses, cars, or any other tangible object that is a part of the individual’s property;
- **Assets or expenses insurance:** it protects the insured against the possibility of a decline in total assets as a result of unintentional injury claims against third parties (as is the case with third-party liability) or even unanticipated costs, such as urgent medical care;
- **Damage to persons:** this group of insurance covers situations where an insured person is affected by financial difficulty, for instance unemployment, or difficulties that might affect the entire household.

Life insurance

In the case of an event pertaining to the life of the insured or the policyholder (the two figures may coincide), such as death or disability, life insurance policies require the insurer to pay a lump sum or an annuity to one or more beneficiaries listed in the insurance contract. Some types of savings are primarily intended to safeguard the insured and his family from situations related to a lack of knowledge regarding the average lifespan. There are different types of life insurance [25]:

- **“Life” policy:** If the insured is still living when the contract matures, the corporation is obligated to recognize a capital sum or an annuity;

- "Death benefit" insurance: If the insured person passes away, the corporation agrees to compensate the insurance contract's beneficiary;
- "Blended" policy options: If the insured is still alive when the insurance contract expires, the company is required to pay the capital, but the agreement also calls for the payment of a capital sum to the beneficiary in the event that the insured passes away during the term of the agreement;
- Index-linked policy: This particular contract type has a strong financial content. It connects the insurer's performance to that of a specific index. The policyholder typically pays a single premium in exchange for a capital sum that is equal to the premium paid and is revalued based on the increase in the reference index during the contract's duration;
- Unit-linked policy: A life insurance policy with a significant financial component that ties the insurer's benefits to the value of the quotas in one of the insurance company's internal or external investment funds;
- Revaluable policy: A life insurance policy that combines the benefits paid by the insurer and, optionally, the premiums the policyholder must pay with the profit the insurer obtains by investing the premiums collected.

1.2 The evolution of the insurance market

The insurance market has undergone profound changes over the years. The structure and competitiveness of the sector, its operating mechanisms and the characteristics of supply and demand have evolved.

The entry into force of the Maastricht Treaty on 1st November 1993 can be regarded as a turning point for the insurance industry. The market was previously characterised by high barriers to entry, low competition, well-defined operators and central role played by intermediaries responsible for the relationship with the end market. This allowed insurers to work in a 'protected' environment and guaranteed them the prospect of large profits.

Following the birth of the European Union in 1993 and the creation of a single market in 1999, the volume of trade increased and the centuries-old trade and financial barriers between sectors were eliminated.

For Italy, as for most EU member states, this evolution was immediately manifested through the provision of numerous legislative measures that led to profound changes in terms of transparency of distribution and contractual conditions and greater uniformity between companies of different countries.

With the creation of the single market and the introduction of the euro, major insurance groups began to look for growth opportunities outside their home territory and to position themselves in foreign markets as well. Major changes in the management of insurance companies have resulted from the internationalization and globalization of markets, as well as from deregulation at the national level. These factors have caused an increase in competition and a resulting decline in profit margins, forcing insurance companies to use the price

lever to make their contracts more enticing. In order to survive and better take advantage of economies of scale and synergies, this phenomenon gave rise to a strong trend of concentration in the insurance industry, which resulted in a true structural transformation. This was especially true for nations like Italy where there had previously been stable competition.

With the differentiation approach, the selection of goods and services was increased, and the traditional insurance protection was complemented by additional options that were more and more significant to customers: for instance, UnipolService represents a significant example of business specialization in the insurance sector, to provide additional services to customers. Further mobility products and services will be analysed in the following chapters.

The propensity to invest in innovation, spending in new product development, operational efficiency, and service quality in order to maximize relationships with customers is another important aspect of the fundamental shifts. Additionally, the distribution environment has changed as a result of the globalization of markets and heightened competitive pressure. Insurance businesses, which formerly competed solely among themselves in an environment with a small number of intermediaries and a common single-channel strategy, now find themselves competing also with other types of operators (such as banks and postal services).

II. INSURTECH

2.1 Insurtech industry

Over the past two decades, innovative channels have flanked traditional distribution channels. These new channels have become increasingly relevant, leading insurance companies, which have always been static and considered prudent and conservative, to acquire dynamism, changing the structures of the industry at a very fast pace. Around the world, technology is advancing at an astounding rate. The rise of the 'Fintech' phenomenon has piqued the curiosity of many in recent years, particularly in terms of how it has disrupted the banking industry. Riding the Fintech trend, the insurance business has expanded significantly, with the establishment of multiple companies providing so-called 'Insurtech' services. The name 'Insurtech' is the meeting and synthesis of the insurance and technology worlds.

By proposing innovative offers, Insurtechs disrupt the established business model of historical operators and can attract and involve customers in a completely different way than traditional insurance businesses. They frequently "enable" incumbent insurers' value chains by providing technologies and solutions that boost operational efficiency. In this environment, emerging technologies such as cloud computing, Big Data, blockchain, artificial intelligence, and the Internet of Things are having a growing impact.

In this perspective, the insurance sector is rapidly evolving, and the number of players within it is expanding and diversifying. Historical players will have to "compete" or "ally themselves" with Insurtechs. As a result, extraordinarily stringent requirements for the underlying infrastructure, both in terms of technology and market laws, have emerged. By

delivering specialized solutions within each category, Insurtech players have begun to disrupt segments of the insurance value chain.

In the insurance industry, innovation has traditionally been linked to a certain conservatism that ensures that companies retain their capital for their intended purposes and do not get carried away by the latest fashions. This conservatism served most organizations well throughout the 2008 financial crisis, but it may be impeding the flexibility required to survive and thrive in a post-crisis environment given the fast rate of change.

The Insurtech Global Outlook 2023 reveals that investments in Insurtech have experienced substantial growth over the past decade. Starting from around one billion dollars in 2013, these investments reached 8 billion dollars in 2022 through 470 deals, making it the second-best period in terms of the number of partnerships.

In 2019, North America and Asia emerged as the continents attracting the most investment, with \$4.6 billion and \$1.3 billion respectively, while Europe lagged with only \$897 million. However, in 2020, Europe managed to gain ground and surpass Asia, narrowing the gap with the United States. This represents the closest margin between the two regions in history. The insurance sector is currently undergoing an unprecedented evolution and is making remarkable progress in adopting various technologies [5].

2.2 How are Insurtechs innovating

When trying to understand the differences between Insurtech and insurance business there are three approaches to consider [3]:

- Leverage the most advanced technologies. The most innovative technologies are at the heart of every Insurtech solution. Insurtechs are not only the first to integrate several innovative technologies into their business model but they can leverage them to get the best solutions and use cases to offer to incumbents and customers;
- Focus on improving the experience to foster a user-centric approach. Insurtechs' innovative drive in this area is critical. They refine the buying process from a customer's perspective, supporting policyholders during risk assessment or assisting claims adjusters in evaluating claims;
- Have an agile culture and approach and advanced analytics to make business decisions. Insurtechs incorporate advanced analytics into their internal management but they also use it to make business decisions on a day-to-day basis. They are also prepared for the idea of failure and learn from their failures in the best tradition of start-ups.

2.3 Classification of Insurtechs

The types of Insurtechs vary in their relevance to specific assets, their value-added, and their business and operating models. According to the findings of the Capgemini 2018 World InsurTech Report and based on the vertical integration of insurance companies, the Insurtech companies can be classified into Enablers, Distributors and Full Carriers [4].

- **Enablers** are Insurtechs providing software solutions to incumbents. They are partners attractive to incumbents looking to improve their technological capabilities and optimize their current business model;
- **Distributors** are Insurtechs that provide only insurance products. They improve the customer experience by providing users with extensive opportunities for information and choice, as well as potential price reductions;
- **Full carriers** are Insurtechs that develop and distribute insurance products. They represent a considerable change from traditional insurance models and can generate upfront costs and a challenge when it comes to integration into traditional companies.

2.4 Game-changing technologies

The insurance industry has gradually applied various technologies to transform and improve existing businesses. In this context, technology is driving industrial transformation, representing the hub that connects all market entities. Currently, as previously mentioned, a significant impact on the insurance industry is made by the following technologies: cloud computing, Big Data, Artificial Intelligence, Blockchain, and the Internet of Things.

Among these, the computational capabilities provided by cloud computing have served as an important foundation for the implementation of many of the other technologies. For example, as soon as cloud computing developed, the demand for storage, management, and analysis of large quantities spurred the demand for Big Data. Thanks to the computational resources of cloud computing and the "data resources" of Big data, Artificial Intelligence was realized.

Later, Blockchain and the Internet of Things emerged, both of which have incorporated various technologies, applications, and innovative ideas. In addition to these new technologies, developments in many other fields have also brought tremendous changes in the insurance industry. 5G must also be included, which, while not directly influencing the insurance industry, will integrate with other technologies promoting, in particular the development of IoT. Insurtech includes different types of technology and can, therefore, present itself in many forms.

Digital technologies pioneered by Insurtechs are helping the industry deliver better customer experiences and improve efficiencies. Many firms are embracing embedded insurance and platform-based business models, leaning on data-driven insights to help facilitate customers' digital journeys.

Four key technology themes that are shaping the industry include:

1. **Artificial intelligence** helps leverage AI-based platforms to boost the effectiveness and efficiency of critical functions. Already, automation is being used to streamline the claims journey from the first notice of loss to adjustment and settlement.
2. **Big data** are used to improve underwriting processes, mitigate losses, and enhance customer personalization. Data collected from wearable devices is helping life and health insurers make smarter underwriting decisions.

3. **Embedded insurance.** Using open application programming interfaces (APIs) to seamlessly integrate insurance products and solutions into customers' digital journeys has become an important avenue of growth. For banks, vehicle manufacturers, and other partners, adding insurance products to their ecosystems can increase revenue and improve value propositions, resulting in a win-win for insurers and distributors.

4. **Cloud-based platforms and as-a-service business models** are used by Insurtechs to integrate components of AI, big data, and open APIs in pursuit of greater speed and efficiency across their value chains. Cloud-native core platforms are being used more often to rapidly develop and deploy new products.

III. AI IN THE INSURANCE FIELD

Artificial intelligence is described as the science and engineering of manufacturing intelligent machines. In more detail, it is the part of computer science concerned with designing intelligent computer systems, systems that exhibit characteristics associated with intelligence in human behavior such as understanding written and spoken language, learning, reasoning, or solving problems [17]. A worldwide definition given by Kelley (2018) [14] defines AI as a computer system that can sense its environment, comprehend, learn, and take actions from what it is learning.

According to their level of intelligence, the three forms of artificial intelligence can be defined: narrow, general, and super [12]. Artificial narrow intelligence systems, which will be described more deeply further on, are programmed to carry out extremely specific manual or mental activities; they function in a predefined context. Artificial general intelligence, on the other hand, focuses on more complex issues and is capable of analyzing its environment and responding in an emotional manner equal to that of a person. Artificial super-intelligent systems, which have the potential to surpass humans in a variety of fields, have not yet been created and years of research are still needed.

Artificial intelligence algorithms are capable of learning and improving themselves autonomously based on prior experiences, in contrast to classical rule-based systems, where data is rigorously processed as initially defined by programming rules [15]. Machine learning is the process used to train these algorithms to generate artificial intelligence. It includes four different learning methods: reinforcement, semi-supervised learning, unsupervised learning, and supervised learning [8]. In supervised learning, which is the most popular type of machine learning, each component of the input and output data must be defined by humans. The algorithm is then trained to identify the relationship between the input and output variables of the data set, resulting in the most accurate replies. Unsupervised learning, which does not use predetermined output variables, is the second most popular type. The algorithms' objective is to independently find patterns and structures among the input variables.

The entire insurance sector is being transformed due to artificial intelligence, and this process of recent innovations

related to generative AI technologies started a long time ago. In areas where it is necessary to process enormous volumes of data, obtained through IoT and other big data sources, relying on algorithms and machine learning systems is becoming an essential strategy.

Even before the implementation of new technologies, insurance businesses were constantly managing large volumes of data, regardless of the line of business in question. The only effective way to handle them has always been to rely on statistical and historical data, as well as on the substantial use of live agents, who, up until the early 1990s, served as the middleman between customers and insurance companies. The era of digitization and the proliferation of online insurance have gradually weakened human connection, and there has been a parallel rise in the number of contracts signed with businesses that only operate remotely, initially over the phone and then rapidly shifting to the many web-based businesses available today.

In the last years, we have witnessed a continuous integration between the insurance industry and advanced technologies such as artificial intelligence, with the aim of offering improved efficiency, reduced costs and enhanced customer experience; to do so, the next generation of generative artificial intelligence demands a tremendous amount of computational power. The beneficiaries of this change are not only insurance firms, but also the end consumer who now has access to speedier and more timely services; although automation is causing a significant decrease in the workforce, it is also lowering costs for the business and its clients. New types of individualized insurance that are developed based on an examination of a customer's anticipated needs and insights, such as historical claims data, credit scores, and social media activity, are increasingly becoming available. As a result, so-called "micro-insurances," or extremely particular contracts that take into consideration a growing variety of criteria, may develop. This might result in services becoming available through proprietary applications more quickly and can enable insurers to offer personalized coverage to customers and price policies more accurately.

According to an EY¹ study, 87% of consumers agree that the efficiency of claims processing affects their choice to renew their insurance with the same insurer. Without involving humans, claims handling can be facilitated and accelerated by AI and machine learning (ML) algorithms. Elements like picture recognition, data unification, data analysis, and cost prediction can all be determined with the support of ML. In order to facilitate claim settlement, ML algorithms often examine pictures and sensors combined with the insurer's historical data.

According to a McKinsey report, "As AI becomes more deeply integrated in the industry, carriers must position themselves to respond to the changing business landscape." Insurance companies must comprehend the elements causing this transition as well as how AI can alter the claims handling, distribution, underwriting, and pricing procedures.

¹EY is a global leader in assurance, tax, transaction and advisory services.

This will not only cause a change in the infrastructure (to ensure the correct processing of data), but also in the approach of the insurance companies themselves, developing a more preventive attitude concerning the remedial one used previously. The concept of risk is therefore changing, becoming more specific and predictive than it was only a few years ago, and this ties in very well with the new micro-insurances we spoke about earlier, which are only possible with a detailed knowledge of a customer's history and his real needs. It is a fact that a greater number of data and sources available will allow better delineation of offers, rewarding the most virtuous customers at the expense of the dishonest ones.

3.1 Drivers

Because COVID-19 dramatically altered the timescales for adopting AI, insurance organizations had to significantly accelerate their choices regarding innovation, since it is clear that the increased focus on digital technology and an increased willingness to change will put these organizations in a better position to accomplish so.

Four major technological advances that are closely related to AI will change the way that insurance is done [2]:

1. Increase of data coming from connected devices (IoT)

Sensor-equipped technology has been rapidly increasing in the recent years. Along with new, expanding categories like apparel, eyeglasses, home appliances, and medical devices, the penetration of existing devices (including automobiles, fitness trackers, home assistants, smartphones, and smartwatches) will continue to develop quickly. By 2025, experts predict that there will be up to a trillion connected devices. Such devices will generate a flood of new data that will enable carriers to better understand their customers, leading to the development of new product categories, more individualized pricing, and an increase in the real-time delivery of services.

2. Rise in the use of physical robotics

Recent developments in the realm of robotics are influencing how people interact with their environment. Future commercial insurance products will be significantly altered by additive manufacturing, often known as 3-D printing. Carriers must evaluate how the widespread use of 3-D printed buildings could impact risk evaluations. Additionally, in the following ten years, commercially feasible drones that can be programmed, autonomous farming tools, and improved surgical robots will all be accessible. The number of standard vehicles with autonomous characteristics, such as self-driving capability, will increase significantly by 2030. Carriers will need to comprehend how and to what extent risks will be affected, customers' expectations will change, and new products and channels will become possible as robotics becomes more prevalent in society and across industries.

3. Open-source systems

Open-source protocols will develop to ensure that data may be shared and used across industries as mass information becomes ubiquitous. Several public and private organizations will collaborate to build ecosystems that will allow them to share data for a variety of use cases while operating inside a shared regulatory and cybersecurity framework. Wearable data, for instance, might be transferred directly to insurance companies, and connected home and auto data may be made accessible through companies like Amazon, Apple, Google, and a wide range of consumer electronics producers.

4. Cognitive technology advancements

The use of cognitive technologies will be implemented in many applications, for instance, Convolutional neural network (CNN)² and other deep learning technologies, which are currently mostly utilized for unstructured text, audio, and picture processing. The extremely large and complex data streams produced by "active" insurance products linked to an individual's behavior and activities will be processed by these tools, which are loosely based on the human brain's capacity to learn through decomposition and inference. Carriers will have access to models that are continually learning and adapting to the world around them thanks to the rising commercialization of these types of technologies, enabling new product categories and engagement strategies while responding to changes in underlying hazards or behaviors in the environment.

3.2 Narrow AI

Taking the functioning of the human brain as a starting point, an A.I. is capable of performing some of its functions [23]:

- Acting humanly (i.e., indistinctly concerning a human being);
- Thinking humanly (solving a problem with cognitive functions);
- Thinking rationally (i.e., exploiting logic, as a human being does);
- Acting rationally (initiating a process to achieve the best expected outcome-based accordance with the available information).

These considerations allow AI to be classified into two main types, weak and strong. There are two different and opposing schools of thought, distinguished by vision and goals: one aimed to replicate the full range of human intellectual and cognitive faculties, emulating the way one responds to stimuli from the external mode: this was the so-called "strong artificial intelligence" (strong AI); the other, on the other hand, focused exclusively on the execution of single and limited tasks (e.g., playing chess) belonging to a specific domain. To contrast and distinguish it from the former, it was called "weak artificial

²Convolutional neural network or CNN is a class of neural network particularly efficient at processing input with a grid-like architecture, like an image. A binary representation of visual data is a digital image. It is made up of a grid-like arrangement of pixels, each of which has a pixel value to indicate how bright and what color it should be.

intelligence” (weak AI or even narrow AI). It is important to note that this distinction, however, is far from sharp and absolute. One could say that the existing boundary between strong AI and weak AI is vague and uncertain [19].

In the insurance industry, it has three main tasks:

- First, it can automate repetitive data tasks (such as application and demand classification);
- Second, it can generate insights from large and complex data sets to improve decision-making (e.g., portfolio management, risk assessment);
- Third, it can improve parametric products and risk solutions.

Artificial intelligence enables insurers to become more efficient and offer new solutions, but it is important to remember that nowadays the whole system, including human interaction, is required to use it. Therefore, the added value of AI comes only from the intelligent combination of AI models and human processes, not from the AI model itself.

Currently, the most widely used AI technologies in the insurance industry are machine learning, natural language processing, and computer vision. AI applications must meet many administrative, organizational, and cultural prerequisites to benefit the insurance industry and society at large.

Through various entry points, AI has the potential to influence and add value to the entire insurance value chain and bring significant benefits to customers. However as these powerful tools become available, it is important to be aware of the risks and challenges involved. Data agility and responsible artificial intelligence are critical for companies to enable people to control decision-making. There are many new risks associated with the widespread use of AI that policymakers, large technology companies, and insurance companies must now consider to ensure that AI adds value to society and remains effectively protected [16].

3.3 Use cases and benefits

Various AI applications are currently in use in the insurance industry, ranging from underwriting to claims processing [9]. Each of these applications brings with it different benefits, enabling the insurance market to create value. Technological advances enable cost reduction, increased efficiency and customer satisfaction, thus creating a lasting and valuable relationship [22].

Some of the applications and their benefits are outlined below.

Underwriting

With respect to risk assessment and subsequent pricing, AI provides crucial support. Manual underwriting is time-consuming. In addition, interactions between insurers and customers are infrequent, so underwriting and pricing decisions here are based on a limited amount of data, relying mainly on underwriting questionnaires and claims databases. As a result, it is easy to make mistakes and set an inefficient price. Risk assessment requires in-depth knowledge of the customer’s profile to determine a price and product suited to

their characteristics. Therefore, Insurtechs place data at the center of their business model.

Artificial intelligence provides access to large amounts of data, improving the accuracy of the pricing process. Thanks to the digitization of current touch points or access to new data assets with digital partners, such as telematics, remote sensors, satellite photos, or digital wellness records, this data can be collected, stored and processed, in an automated way, avoiding form filling or other repetitive tasks.

This represents a crucial competitive advantage since it guarantees the transformation of those data into useful insights and the generation of more specialized and personalized coverage and price for customers. AI gives insurers additional options for setting prices, creating products, and combining data to create new risk factors, with the final aim of providing more precise insurance coverage.

Customer service

Conversational AI, which is natural language processing-based is capable of deciphering both spoken and written human language and responding appropriately. It provides a human-like interface between customers and the insurer’s technology. Voice assistants and chatbots already provide 24-hour service while keeping a high level of quality: without human assistance, these AI technologies can direct users through a variety of queries. The future objective is to develop a more sophisticated and specialized conversational AI to handle more complex communication.

Customers are therefore able to manage their own needs themselves; there is no longer a need for an employee for each customer. As a result, insurers can increase the number of customers served while maintaining or increasing the quality of service provided. The company is thus able to achieve economies of scale and gain a competitive advantage.

With Conversational AI, not only are costs lowered by not having to set up an entire customer service department, but service can be offered in real-time. The talks will be quicker and more pertinent enabling a drastic reduction in waiting times, improving efficiency and putting the customer at the center of attention, to ensure an increasingly personalized service directed at meeting specific needs and requests.

Chatbots can answer all frequently asked questions, simplifying day-to-day activities, and allowing the team to save time and spend it on more complex tasks. Virtual agents can also analyze the pattern of inquiries and customer behavior, to subsequently offer personalized and ad hoc service, also based on previously collected information. By analyzing these patterns using artificial intelligence, companies can predict when customers might churn, enabling them to implement measures to retain customers.

Claims

Insurance companies need to be able to handle claims and assist clients, while examining numerous policies and detailed information, resulting in a tedious procedure.

AI assists both the client and the insurer in the claims process. It allows to guide the client through the claim submission process without encountering any problems or delays.

From the insurer's perspective, much of the claim's process is automated, from claims analysis to approval, thus ensuring efficiency, and speed and limiting human intervention. The use of AI saves a significant amount of time that is usually lost in preparing data for claims analysis and damage assessment. In 2017, for example, Lemonade, an innovative New York-based Insurtech company, claimed to have paid the fastest claim in the history of the insurance industry in just three seconds [24].

AI's image recognition technology through the use of CNN can automatically read, comprehend, and analyze documents and photos (for example, by identifying different types of vehicles, extracting data from medical records, or assessing damage).

Processing claims takes time, but it also erodes revenue. The largely manual processing of claims is also prone to errors, which can further increase insurers' operating costs. Using artificial intelligence, a company could reduce its staff hiring spending and payouts and change the underwriting process.

In addition to increasing efficiency and insight, AI technology can also enable the creation of new approaches and insurance coverage for risks that were previously not insurable. An example is represented by Swiss Re's parametric flight delay compensation, which exploits an AI algorithm that anticipates flight delays. As a result, customers who acquired the insurance while purchasing their tickets will receive an immediate payout in the case of a delay, eliminating the need to submit a claim, and reducing cost and time for both parties, insurer and client.

Fraud

According to the Federal Bureau of Investigations [21], the insurance sector consists of more than 7,000 insurance companies that collect premiums of over a trillion dollars a year. The sector's dimension combined with its peculiarities contributes to making it an ideal location for criminal organizations. An American household is impacted by insurance fraud on average by \$400 to \$700 per year in higher insurance premiums, with the total cost of insurance fraud estimated to be more than \$40 million per year for non-life insurance alone. Fraudulent activities can range from staging an accident, misrepresenting the circumstances of a claim, changing the actors, the causes and extent of the damage, etc. Therefore, the insurance industry has an increasing need to develop capabilities to detect potential fraud with a high degree of accuracy, thus enabling it to go into detail on those claims that are suspected to be fraudulent.

The chance of fraud can be decreased in several ways by combining data collecting with proper machine learning and artificial intelligence systems: AI systems that autonomously examine the damage photographs can distinguish between genuine and malicious damage. Cross-checks can be used to confirm the authenticity and provenance of assets utilizing the vast amounts of information that Insurtechs have access to. In this way, for instance, it is possible to verify whether a damaged good for which a person is claiming compensation is really owned by that person or not.

Furthermore, by allowing for a comparison of the parties' versions of the events, AI can also help to reduce fraud

by ensuring that each party's description of what occurred is compatible with the claims made by the other parties. Additionally, it is feasible to determine whether or not what was said is real by merging data from smartphone GPS or car sensors. As illustrated by the forthcoming case study, the presence of black boxes and integrated sensors offers a means to validate the accuracy of individuals' claims, thereby facilitating a more precise allocation of responsibility in accident scenarios.

3.4 Risks

The introduction of a new technology brings with it not only benefits but also numerous risks. These risks must be identified and managed to prevent unpleasant consequences.

The first problem that arises with the implementation of AI concerns the workforce. As mentioned earlier, due to automation, the availability of one insurer per customer will no longer be required.

According to a BCG research, policy management positions will shrink by 70 percent and claims positions by 40 percent. On the other hand, technology departments will grow by 50 percent. The work of many individuals will become obsolete. Despite the potential job loss, however, new opportunities emerge. Rather than being replaced, many roles will be updated to adapt to new technologies and the new ways of working and processes that will result. Moreover, many people who can combine strategic and creative concerns with artificial intelligence algorithms are in demand [13].

A second problem in successful Artificial Intelligence implementation concerns the lack of appropriate operating models and the right mindset.

A change in mindset is needed from the people who make up companies, both at the operational and strategic levels. New technologies transform the way business is done, and employees need to be open to dealing with changes at the operational level. On the other hand, at the strategic level, it is necessary to be open to changing the way decisions are made and strategies are formulated. Many executives tend to be too cautious, too unwilling to accept technical, operational, and business risks, and approach these technologies to address narrow topics rather than high-value problems.

In addition, when the results of the investments made are not visible, the hesitation to devote enough money, time, and attention increases. Short-term thinking and the quest for quick wins do not give AI solutions time to learn and demonstrate their value, generating significant financial benefits. Embracing AI is a journey, organizations need to define a clear vision of how it can benefit their operations and align with business objectives.

Another risk of significant importance is the loss of privacy. When it comes to personal information, particular attention must be paid. Safeguarding customers from the exploitation of their personal data for unintended purposes is essential. Due to the valuable nature of the gathered data, insurance companies may be tempted to sell them to third parties such as advertisers, marketers, and political parties to cover collection costs.

The moral and ethical issues are starting to be addressed. In particular, the Italian insurance supervisory authority, the Institute for the Supervision of Insurance (IVASS), in 2021 acknowledged that alongside all the previously described benefits, the misuse of artificial intelligence technology carries ethical, moral, and legal risks. The objective is to push towards an ethical use of AI, combat the risks of illegality proliferation, and promote transparency. Meanwhile, efforts are also being made at the European level to establish standards and limits for AI technologies, including in the insurance sector. Regulation will be necessary, not only at the European level but globally [7].

The European Union is also taking action to address another highly relevant issue: discrimination [20]. In the definition and development of various stages of data acquisition and information extraction, human biases create machines that, like humans, exhibit discriminatory behaviors. With the pervasive diffusion of AI, there is a risk of it becoming a tool for fueling and reinforcing stereotypes and prejudices [18]. One of the most evident examples is represented by the COMPAS (Correctional Offender Management Profiling for Alternative Sanctions) algorithm used in the US judicial systems to predict the likelihood of an offender becoming a recidivist. Due to the data used, the chosen model, and the overall algorithm creation process, the model predicted twice as many false positives for recidivism among non-white (45%) compared to white individuals (23%) [6].

In the insurance sector, there is a possibility of being judged as a higher or lower insurance risk based on belonging to a particular demographic group. The implemented algorithm must be designed to eliminate distortions and hidden inequities in the data collection and knowledge extraction phase; the use of decision-making solutions should be more mindful and critically evaluated [26].

The advent of AI introduces a whole new realm of personalized discrimination, leveraging the abundant personal data it has access to, including consumer behaviors and preferences. An example is genetic discrimination in health and life insurance. Premiums can be increased or coverage denied based on genetic predisposition obtained from DNA. Furthermore, information regarding consumer spending habits (such as where you shop, what you buy, when and whether you seek discounts or pay full price) enables insurance companies to assess whether they can charge the highest possible price [26].

The management of these risks is the responsibility of insurance companies. They will need to adopt transparent and fair policies, verification, and traceability. It is important to make decisions that can be explained to the individuals involved, to generate trust among customers.

3.5 Challenges and opportunities

By 2030, a much higher percentage of standard vehicles will be equipped with autonomous features, such as autonomous driving. Insurers will need to understand how the increasing presence of robotics in everyday life and across sectors will change risk pools, alter customer expectations and enable new products and channels.

Convolutional neural networks and other deep learning technologies, currently used primarily for processing images, speech, and unstructured text, will evolve and be applied in a wide variety of applications. These cognitive technologies will become the standard approach for processing the incredibly large and complex data streams that will be generated by “active” insurance products tied to an individual’s behavior and activities. With the increased commercialization of these types of technologies, carriers will have access to models that are constantly learning and adapting to the world around them, enabling new product categories and engagement techniques while responding to shifts in underlying risks or behaviors in real-time.

In accordance with McKinsey’s insights, insurers can proactively ready themselves for the rapid changes in the industry through the following strategies [2]:

- 1) Embrace AI Technologies: This involves scenario exploration to anticipate disruptions and their implications for various lines of business.
- 2) Craft a Strategic Plan: This entails identifying key investment areas to foster a cohesive analytics and technology strategy focused on value creation and differentiation.
- 3) Establish a Robust Data strategy: This entails effectively managing data throughout the policy lifecycle and integrating internal and external data sources to facilitate agile insights and analysis capabilities.
- 4) Build Talent and Technology Infrastructure: Preparing for the evolving landscape requires nurturing a workforce with the requisite mindset and skills. This includes cultivating a blend of technological acumen, creativity, and adaptability to navigate semi-automated and machine-assisted activities. Augmenting internal capabilities with external resources and partnerships is also essential for driving business evolution and execution.

In light of these advancements and the transformative potential of AI, the insurance industry is presented with unique opportunities to reshape its processes and enhance productivity.

Integrating Wellness and Insurance

An insurance company’s profits depend not just on pricing but also on limiting the payouts. And so, health and life insurance companies are shifting their focus to proactive care in diverse ways with the help of AI. They are launching health apps and medical-grade sensors (utilizing IoT, or the Internet of Things) to help people stay healthy and bundle life insurance policies with health platforms. Insurers can also improve the bottom line by using AI to price their policies more competitively and personalize them.

AI: Future-proofing Insurance

AI’s role in the insurance industry goes way beyond being a fraud detection tool. According to McKinsey, “The industry is on the verge of a seismic, tech-driven shift. AI implementations could increase productivity in insurance processes and reduce operational expenses by up to 40%

by 2030.” Furthermore, AI is set to enhance personnel productivity, customer experience, and business resilience. The world is changing. Autonomous cars, connected houses, and private passenger space will soon be a reality. Insurance firms must adapt to these changes through a planned and measured implementation of AI.

However, there are also inherent risks, including the challenges of workforce adaptation, seamless collaboration with technology partners, and possible issues related to the data.

Traversing the Automation Journey

The journey is not without pitfalls. The workforce has to be retrained. Legacy processes must be worked around. The right technology partner could help provide a road map and circumvent the bumps.

Another important aspect of automation is making employees feel part of the process. Leaders have a huge role to play in this, and they need to train the employees to make the automation process more effortless. The employees should be doing more strategic tasks by the end of the transformation journey. There will be a significant change in the work culture, and the organizations and leaders should be prepared for that. The key to a successful automation journey lies in proper planning and transparency [1].

Insurance companies should prioritize the implementation of AI into existing processes to improve operational efficiency and customer experience. However, there are several challenges that organizations may face during this implementation, such as a lack of high-quality data for accurate predictive analytics, lack of AI expertise, implementation costs, and change management within the organization. To overcome these challenges, insurers need to develop a clear understanding of AI, identify use cases, develop a data strategy, and create an AI team with a clear roadmap [9].

IV. CASE STUDY: UNIPOL GROUP S.p.A.

Unipol Group S.p.A is an Italian financial holding company, which implements an integrated offering strategy and provides a wide range of financial services, specifically active in the supplementary pension and health sectors. The aim is to guarantee companies, businesspeople, and families greater security and confidence in the future, accompanying their choices of protection, long-term savings, and quality of life. Unipol Group offers products and services in several industries, including insurance, finance, real estate, and mobility.

The Financial Times Stock Exchange Milano Index (FTSE MIB), the most significant stock index of the Italian Stock Exchange, includes Unipol Group Ordinary Shares. The group, which counts more than 12 thousand employees and serves around 17 million customers, with total premiums of €13.6 billion, of which €8.3 billion came from the Non-Life business and €5.3 billion from the Life business. Since 2022 the chairman is Carlo Cimbri.

4.1 Insurance, Financial and Real Estate Sector

The Group primarily conducts business in the insurance services sector through UnipolSai Assicurazioni S.p.A., listed on the stock exchange, it is the market leader in non-life insurance in Italy, particularly in motor third-party liability (TPL). UnipolSai operates controlling two specialized firms, Linear Assicurazioni for the direct insurance sector and UniSalute, specifically for health protection. UnipolSai services also include service companies specifically dedicated to assistance, car repair, and the management of “black boxes” for the Motor and Non-Motor classes.

The Group conducts business in the financial sector through UnipolRec, a firm that specializes in the management of non-performing loans.

4.2 Mobility products and services

The Group operates in the mobility sector through a series of companies specialized in specific products and services:

- UnipolService, a business specializing in UnipolSai-insured vehicle repairs.
- UnipolGlass, a UnipolGlass S.r.l brand., a company 70% owned by UnipolService S.p.A. and 30% by DIRA S.p.A., a supplier of car windows. It serves consumers outside the Unipol Group and specializes in installing, repairing, and replacing car windows.
- UnipolRental which is a long-term automobile rental company
- UnipolTech focuses on Group’s telematics technologies and services, to ensure a degree of competitiveness in the Internet of Things market
- UnipolAssistance is a multi-service Unipol Group company that specializes in addressing requests for assistance for all types of vehicles, including personal, domestic, and commercial vehicles.

4.3 Analyzing Unipol Group’s AI strategy

Unipol Group emerges as a dynamic and innovative entity in the Italian insurance industry, committed to offering a wide range of integrated services with a priority focus on customer satisfaction. The analysis will focus on the Unipol Group’s use of advanced data analytics and artificial intelligence to drive innovation and personalize insurance offerings while staying ahead of the curve with initiatives such as telematics and smartphone integration. In addition, the Group’s emphasis on partnerships, data privacy, and a human approach to automation will be examined, emphasizing the Group’s commitment to ethical practices and customer trust. Finally, the analysis will explore the future potential of AI and data-driven decision-making in the context of the Unipol Group always maintaining its leadership position in the Italian insurance industry.

Utilization of Data and AI

The company utilizes data and artificial intelligence to drive innovation and improve operations. It collects data from various sources and analyzes it to gain insights into

customer behavior, driving patterns, and risk factors. These insights are used to develop personalized insurance policies, optimize pricing strategies, and enhance the overall customer experience. Telematics devices, such as black boxes, serve as vital means for gathering rich, real-time data on customer behavior, driving patterns, and associated risk factors. Through analysis and interpretation of this data, the company gains deep insights into individual customer preferences, driving habits, and risk profiles, informing strategic initiatives aimed at enhancing customer value and satisfaction. For example, data-driven analytics are used to develop personalized insurance policies tailored to meet the needs and preferences of each customer, optimizing coverage and fostering stronger customer engagement and loyalty. Moreover, data analytics and AI play a pivotal role in shaping the company's pricing strategies, refining pricing models to accurately reflect risk profiles and market dynamics, ensuring fair and competitive premiums, and maintaining a sustainable business model. Beyond insurance product development and pricing, data and AI capabilities enhance the overall customer experience, enabling advanced predictive analytics and machine learning algorithms to anticipate customer needs and preferences, delivering personalized service at every touch-point, ensuring seamless, intuitive, and highly satisfying customer interactions.

Telematics and Black Box Technology

The company dominates in utilizing telematics data collected from devices like black boxes installed in vehicles. This data serves various purposes, including assessing driving behavior, detecting accidents, speeding up claims processing, and preventing fraudulent claims. By analyzing data from the black box, which includes driving style, distances traveled, and routes taken, the company offers discounts based on safe driving habits and provides tailored insurance solutions. These telematics devices are invaluable for capturing real-time data on driving behavior, vehicle movements, and associated risk factors. As an example, by scrutinizing factors such as acceleration patterns, braking behavior, and adherence to speed limits, the company identifies safe driving practices and rewards policyholders accordingly. Moreover, continuous monitoring of vehicle movements and detection of anomalous events, such as sudden deceleration indicative of a collision, induces prompt alerts to emergency services and streamlines the claims adjudication process. This enhances customer satisfaction, mitigates losses, and prevents fraudulent claims. Furthermore, the company tailors insurance solutions to the unique needs and preferences of individual customers by analyzing driving patterns, distances traveled, and routes taken. This personalized approach enhances customer engagement, and loyalty, and fosters a mutually beneficial relationship between the company and its clients.

Smartphone Integration

The company recognizes the increasing prevalence of smartphones and is exploring transitioning from vehicle-installed telematics devices to using smartphones as personal black boxes. By harnessing smartphone data, including GPS, accelerometer, and other sensors, the company aims to offer

real-time assistance, coach for improved driving behavior, and comprehensive insurance coverage across various modes of transportation. This approach provides greater flexibility and accessibility while still facilitating valuable data collection for insurance purposes. Utilizing smartphones for telematics allows insurance companies to reach a wider audience and gather data from a larger user base, ensuring that more drivers can benefit from personalized insurance offerings and real-time assistance. Smartphones are equipped with various sensors, such as GPS, accelerometer, gyroscope, and others, which can provide rich data on driving behavior, vehicle movement, and environmental conditions. This real-time data collection enables insurers to monitor driving patterns, detect accidents or risky behavior, and offer immediate assistance as needed.

Mobility as a Service

The concept of using smartphones as black boxes becomes particularly relevant in relation to the Mobility as a Service trend. This is because the company anticipates a shift towards ensuring the entire mobility experience rather than just the vehicle itself. In this future paradigm, insurance will cover not only the physical vehicle but also the broader mobility experience, including shared rides, public transportation, and other forms of transportation services. By harnessing technology and artificial intelligence, the company aims to provide comprehensive insurance solutions that adapt to the changing needs and preferences of individuals in the emerging Mobility as a Service ecosystem.

Partnerships and Data Privacy

The company understands the importance of partnerships with service providers to access a wider pool of vehicle data while respecting user privacy. Partnerships with service providers, such as Mobike Technology Co., offer the company access to a broader range of vehicle data. This expanded data pool provides valuable insights into customer behavior, preferences, and usage patterns, enabling the company to tailor its services more effectively and stay ahead of market trends. While leveraging data partnerships offers significant opportunities, it also comes with inherent risks, particularly concerning data privacy and security. The company understands the importance of respecting individual privacy rights and is committed to safeguarding customer data against unauthorized access or misuse. Implementing robust data protection measures and privacy protocols ensures that customer information is handled responsibly and ethically. They are actively exploring solutions to mitigate these risks, including implementing advanced encryption techniques, data anonymization practices, and stringent access controls. By proactively addressing potential risks, they aim to safeguard customer data and prevent data breaches or misuse. Compliance with data protection regulations is a top priority for the company. They ensure that all data practices and partnerships adhere to applicable laws and regulations, such as GDPR. By maintaining compliance and transparency in their data practices, they aim to build and maintain customer trust, reassuring customers that their

privacy rights are respected and protected. Ultimately, the company's focus on data privacy reflects its commitment to a customer-centric approach. By prioritizing customer privacy and data security, they demonstrate their dedication to earning and maintaining customer trust. This trust forms the foundation of long-term customer relationships and underpins the company's reputation as a responsible and ethical data steward.

Use of AI for weather events

In the domain of weather forecasting and insurance risk management, the integration of artificial intelligence stands as a transformative force. Within this landscape, dedicated teams leverage AI algorithms to analyze diverse data streams, allowing for the early identification and prediction of weather phenomena such as hailstorms. This proactive approach ensures timely dissemination of alerts to policyholders through messages or push notifications leading to risk mitigation. For entities like Unipol, this application of AI translates into tangible economic benefits and strengthened customer satisfaction, underscoring the pivotal role of advanced technology in contemporary risk management strategies.

Human-Centric Approach to Automation

While embracing automation and AI, the company prioritizes maintaining a human-centric approach to customer interactions. They recognize the importance of human empathy and intervention, particularly in sensitive situations such as claims processing or client support. Automation is seen as a means of streamlining processes and reallocating human resources to tasks that require creativity, empathy, and problem-solving skills, ultimately enhancing the overall customer experience.

Conservative Approach to Data Management

Unlike some competitors, the company adopts a conservative approach to data management, preferring to retain control over data and expertise in-house. They have established subsidiaries like Leithà s.r.l. to manage and extract value from data assets internally, rather than relying on external solutions or data outsourcing. This approach allows them to protect their data investments and maintain a competitive advantage in the market while ensuring the security and integrity of customer information.

This transformative journey needs careful consideration and proactive measures to address associated challenges. Retraining existing staff members to adapt to AI-driven processes is essential for fostering a culture of innovation and maximizing the technology's potential. Additionally, organizations must prioritize safeguarding data privacy and cybersecurity integrity to mitigate potential risks and ensure compliance with regulatory requirements.

Conservative Approach to Data Management

The company believes that data-centric enterprise intelligence (DCEI) will play an increasingly prominent role across various sectors in the future. They see potential for

AI to evolve into a supportive role, providing insights and recommendations to aid agents in client interactions. While AI is currently focused on core company processes such as claims management and pricing strategies, there is potential for expansion into other areas, such as product proposals and customer service.

The company remains committed to staying ahead of technological advancements and leveraging data and AI to drive innovation and adapt to changing market dynamics. The company recognizes the evolving landscape of artificial intelligence and envisions AI transitioning from its current supportive role into core company processes. While AI is currently concentrated in certain areas of the business, such as claims management and pricing strategies, the company sees vast potential for its expansion into other domains. These may include product proposals and customer service, where AI-driven insights and automation can streamline processes, improve efficiency, and deliver personalized experiences to clients.

The company is committed to staying at the forefront of technological advancements. By embracing AI and DCEI, they aim to drive innovation within the organization and across the insurance industry. This proactive approach ensures that the company remains agile and adaptable in response to changing market dynamics and emerging customer needs. By adopting a data-centric approach to enterprise intelligence, the company can harness the full potential of its data assets to drive informed decision-making, optimize business processes, and unlock new opportunities for growth and differentiation. By leveraging these technologies, they aim to enhance the overall customer experience, providing tailored solutions, proactive support, and seamless interactions across all touchpoints. This customer-centric approach not only fosters loyalty and satisfaction but also positions the company as a leader in the increasingly competitive insurance market.

V. CONCLUSION: THE FUTURE OF AI AND INSURANCE

The rapid developments in Artificial Intelligence and Machine Learning are set to dramatically change the world we live in. These technologies will also bring great changes to the insurance world, altering insurance premiums and creating new classes of risks. They can potentially perform many of the typical tasks of actuaries, so much so that some strands of thought believe that these technologies may replace the work of actuaries altogether [2]. This means that actuaries must adapt and acquire new roles as old ones become redundant. The real challenge for actuaries is managing an increasingly narrow world, where the connections between data - as well as the size of data - are expanding exponentially. Actuaries must evolve to collaborate with a diverse array of professionals, including data experts, data scientists, economists, financiers, mathematicians, computer scientists, managers, and more. This evolution is essential for actuaries to maintain relevance in the rapidly advancing high-tech business landscape.

Although AI succeeds in replacing those routine jobs, the role of the actuary remains crucial because, while it is true that algorithms will contribute to the emergence of this new

service, the actuary will have to update the entire process whenever an industry innovation is introduced, as well as understand the client's needs [27].

New sources of digital data, such as social media or smartwatches, reveal information about behaviors, habits, and lifestyles that enable better assessment of individual risks than ever before. The new data generated by body monitoring devices that will track sleep quality, number of steps, calories burned, blood pressure, and weight will have a strong influence. Such tools will allow physicians to monitor the health and possible illnesses of patients. Access to this data, both for physicians and insurers, would enable them to do their work in a new form, especially allowing insurers to develop contracts based on different statistics for each individual client. Better data allow premiums and risks to be more appropriately aligned and the overall cost of insurance to be reduced. This has great economic and social benefits because it reduces the cost of information asymmetries in insurance markets and improves efficiency, thereby increasing insurance protection.

When a customer's quantifiable behaviors enable risk reduction or elimination, they become eligible for insurance premium discounts. However, this incentive is based on customers' willingness to share such data with insurers, posing a privacy concern. This issue could be resolved by offering appropriate incentives. For instance, some car insurance companies offer premium discounts to customers who install monitoring devices, granting access to driving behavior data for tailored discounts. This arrangement attracts cautious drivers, fostering a self-sorting mechanism where 'safe' drivers choose to join, redistributing premiums and incentivizing prudent driving. While this benefits the community by promoting safer behavior, a similar approach in health insurance might lead to discriminatory pricing against less 'healthy' individuals. In this sense, regulation plays a significant role in setting boundaries concerned with transparent policies, informed consent, robust data protection measures, limited access, anonymization, clear retention guidelines, transparency, and regulatory compliance.

Swiss Re Group analyses the potential impact of AI across the insurance industry (Fig. 1). It categorizes this impact into three levels: low, medium, and significant. While tasks like market research and collections may experience low impact, areas like product pricing, sales management, and claims management could see significant AI influence. The chart predicts AI automating tasks like underwriting based on sensor data and streamlining simple claims processing. Overall, AI is predicted to significantly impact all areas of insurance, with the level varying depending on the specific task.

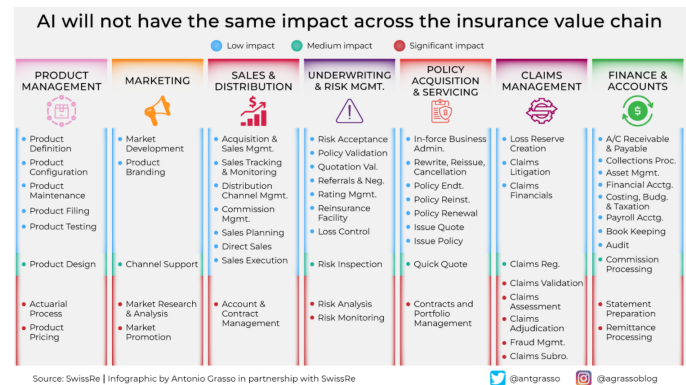


Fig. 1: AI impact across the insurance value chain.

Fonte: [10]

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