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Advancing Group Insurance Solutions Through Ai-Enhanced Technology Architectures And Big Data Insights

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1. Abstract

Advancements in group insurance solutions have long struggled to match the ever-changing expectations of insureds in the face of emerging risks, evolving technology, demands for immediacy, and the ever-increasing use of personal data. Although change is felt at all layers of the information technology ecosystem associated with group insurance, solutions have only cursorily benefited from advanced automation and enhanced analytic insights. We argue that the demands from insureds and the accompanying change drivers can only be addressed through AI-enhanced technology architectures, with a multi-layered view of the group insurance information technology ecosystem. At the core of an architecture that delivers the necessary level of adaptability and flexibility as well as the use of extensive internal and external data resources to uncover and characterize the complex relationships among risk frameworks, technology capabilities, and product and data designs is a hierarchical knowledge graph. Supported by a technology mix that utilizes cloud-based microservices and applications as well as distributed ledger marts, knowledge graphs hold the key to achieve the necessary level of speed, product design, technology integration, process automation, decision making, and customer trust in a rapidly evolving, disruptive, and competitive marketplace focused on group insurance.

The work we present aims to do three things. Firstly, we describe the challenges group insurance faces well into the future from the twin perspective of insureds and the marketplace. Secondly, we bridge the demands and the necessary as composite solutions that are AI-enhanced, through guiding technology and data architectures, that address the analytics, automation, and IT complexity at scale. Thirdly, upon the culmination of these solutions through multi-layered architectures with knowledge graphs at the core along with a curated AI technology stack, we sketch out potential resultant group insurance products and services forms.

Keywords : AI in Group Insurance,Big Data Analytics in Insurance,Insurance Technology Architecture,Predictive Modeling for Insurance,Machine Learning in Underwriting,Data-Driven Insurance Solutions,AI-Powered Risk Assessment,Digital Transformation in Insurance,Smart Insurance Platforms,AI for Claims Optimization,InsurTech Innovation,Real-Time Insurance Analytics,Group Benefits Optimization,Automated Insurance Workflows,AI-Driven Customer Personalization.

1. Introduction

1.1 Life insurance plays a key role in the overall economy. Providing great comfort for those who depend on us. Generally, its collective nature facilitates lower costs for individuals than for instruments offered in a bespoke manner by financial institutions. However it is not easy to keep a healthy balance in the risk-sharing mechanisms which constitute the essence of group insurance. Events like the outbreak or climate change driven catastrophic events pose severe threats for the viability of group risk covers, which can require higher premiums or adjustments in the coverage structure. Fortunately, despite the strong asymmetry in the information between the client (the group) and the providers of group insurance solutions, exciting new technologies provide us with great potential to improve the risk transfer and claims management processes.

1.2 In today's information society, where credible data are readily available, actuaries and insurance companies can extract much more value from Big Data and Artificial Intelligence technologies for the purposes of modeling group insurance services and risks. This applies not only to traditional group insurance covers over mortality and morbidity. On the contrary, the group risk space is widely seen as a potential massive breakthrough for data-driven solutions and associated innovative insurance technology services. Industry experts suggest that the expansion and use of AI Data Technologies will reinvent benefit programs like Group Mortality, Decreasing Term Mortality, Group Term Life, Group Permanent Life, Business Travel Accident, Group Accident, Group Short-Term Disability, Long-Term Disability and Group Critical Illness. In fact, the use of data-driven and AI-enhanced software technology in traditional Life Insurance and its associated concepts such as Risk and Insurance Theory has generated record sales growth in the recent years for Accident and Health Insurers focusing on a Data Driven Technology Platform.

1.3 1.1. Background And Significance The group insurance value chain synthesizes the interests of a multitude of stakeholders: Employers or other groups do not want to bear the risk of increased costs from unexpected high health claims. Employees do not want to pay for benefits that are not perceived as valuable, or which are not delivered on a timely basis by service providers. Insurers want to make a profit, but also want to participate in the development of a healthy workforce to reduce their costs. Re-insurers use administrative data across both employer groups and insurance companies to assess risk. Health care systems are key partners in enhancing the health of the covered population, while also being compensated for their services. In addition, regulators monitor this entire value chain to make sure there is incentive alignment among the stakeholders.

1.4 As such, this value chain is undoubtedly complex and, at times, dysfunctional due to incentives that work against each of the participants. This is further amplified by the rising costs of healthcare, increasing for all participants, along with lower growth in economic activity for employers and employees. Additionally, consumer demands are changing in the age of Information Technologies, which have made it easier for consumers from other industries to provide feedback on the products they consume. Employees are looking for more value in terms of where their health insurance dollars are being allocated. Therefore, it is imperative that all participants align their interests through innovative technologies, services and products that participate across the entire group insurance value chain.

1.5 It is our premise that Artificial Intelligence and Big Data insights, deployed in an appropriate IT architecture, can provide the necessary tools to create a more sustainable group insurance ecosystem, where all participants work in tandem to ensure society-wide wellness and budgetary compliance. The remaining sections outline the current situation in the group insurance industry, propose a framework for how to leverage AI and Big Data insights for a more equitable industry landscape and then finitely decompose the framework into critical components and building blocks.

2. 2. Overview of Group Insurance

2.1 Group insurance encompasses both health and non-health group insurance products that offer coverage to a defined group of individuals. Examples of group health insurance products include group medical insurance, group dental insurance, and group long-term disability insurance. Examples of group on health insurance products include group life insurance, group accidental death and dismemberment insurance, and group critical illness insurance. Group health insurance products account for a minority share of the premium income from group insurance and are usually available from the group insurance subsidiaries of major health insurance companies or from specialized niche players. In most industrialized countries, group life insurance and group accident insurance are the most important segments of the group insurance market. Traditional group life and group AD&D insurance cover 60% to 120% of salary and pay lump sums upon death, accidental death, or dismemberment. Group insurance products are distinct from individual insurance products in terms of their structure and the duration and conditions of coverage.

2.2 Group insurance provides many benefits to employers and employees. The benefits to employers include ease of administration, lower take-up and turnover costs, and more predictable costs. Employees benefit through lower premiums. Employers can include group insurance in the employee benefits package, or package it together with other employee benefit programs, such as group retirement plans. Group insurance products have today become the key asset to companies offering traditional employee benefits programs, and are regularly provided by employers in North America and Europe. In many cases, group insurance is offered to employees at a premium that is 20% to 50% lower than is available in the individual insurance market. Moreover, people unable to obtain coverage because of health reasons will often find that they qualify for coverage through group insurance.

Equ 1 : Risk Prediction Model (AI-enhanced underwriting)

$$\hat{R}_i = f(X_i; \theta)$$

- $\hat{R}_i$ = Predicted risk score for individual or group i
- X_i = Vector of features (e.g., health data, behavior, demographics)
- θ = Parameters learned by AI model (e.g., weights in a neural network)
- f = AI function (e.g., logistic regression, random forest, deep neural net)

3. The Role of Technology in Insurance

2.3 The purchase of insurance is often a once a year experience for clients whereby they can humbly request a quote for a renewal and, as long as there have not been any significant changes to their business, wait for an answer. For insurance companies this exchange does not happen very often and, as a result, does not provide an ongoing feedback mechanism for transactions or service level transactions to create efficiencies. The level of complexity involved in the underwriting review, binding, and issuance of a policy can at times be cumbersome and onerous and does not compare to many other electronic transactions. This creates a considerable cost associated with the management of donnee. It is in the best interests of both buyer and seller to streamline and automate the process as much as possible.

2.4 As insurance companies have been successful at improving their cost efficiencies through the rollout of technology internally, this is beginning to shift to the client side in terms of the purchase process. Here we outline the main applications of technology in the delivery and operation of insurance services. This outline is indicative of our position that, for the most part, insurance is to be delivered as a service and not merely as a transactional product for sale to be sold on price alone. Unlike most other services, the acquisition of insurance is often perceived to be a price sensitive commodity purchase. As these other services become increasingly digitized, they are being perceived more as products and less as services. For insurance, such a strategic shift is necessary if the profession's value proposition is to be preserved. Technology solutions must focus on building efficiencies whilst at the same time enhancing the customer experience in a manner that mirrors the growing demand for service delivery refinement across virtually all sectors of the economy.

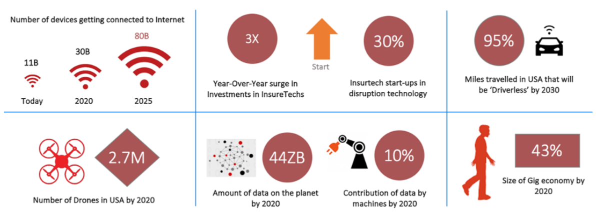

Fig 1: Role of Technology in the Future of Insurance

3. 4. Artificial Intelligence in Insurance

3.1 In recent years, AI has been used extensively in insurance applications, both in automating processes and providing value-added benefits. We highlight in this section the most-used AI methods in insurance and then describe some applications in each of the insurance groups earlier categorized. The two major AI methods used in insurance are Natural Language Processing (NLP) and Machine Learning (ML) methods. NLP has been applied primarily in claims processing, along with chatbots, financial performance, complaint management, underwriting, advertisements, and consumer behavior. ML has been applied widely in fraud detection, marketing and risk analysis, pricing and loss forecasting, claims management and subrogation, and advisor optimization.

3.2 ML finds some of its most important applications in insurance in terms of risk analysis and fraud detection. ML methods such as decision trees, random forests, and neural networks have been applied extensively in the classification of input variables to predict whether a particular policyholder or claimant is associated with a high-risk probability. Predictive classification normally involves hierarchy-Level 0 tasks, such as predicting binary-class labels indicating whether a transaction is fraudulent or not. Hierarchy-Level 1 tasks involve multi-class label tasks that classify transactions into several fraud classes associated with different loss sizes. Fraud prediction systems are normally evaluated using misleadingly high accuracy percentages. Such systems must also avoid false negatives to a great extent.

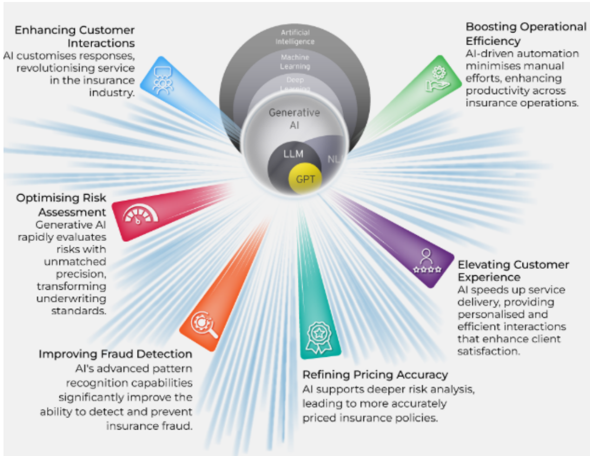

Fig 2: The evolution of AI in the insurance industry

3.3 4.1. Machine Learning Applications Machine learning is a subfield of artificial intelligence that allows computers to learn from data without having to directly program those computers to take an input, do a calculation and provide an output for every input they may encounter. Whenever there is a sufficient volume and diverse nature of data available, and where traditional formulas and metrics become insufficient, machine learning can be employed to identify patterns in an organization's historical data – and apply these patterns to predict future behavior.

3.4 Machine learning may be the most powerful calculator for insurance organizations for many business functions, including fraud detection, loss cost forecasting, underwriting processes, client retention workflows, claims management, and investment strategy optimization, among others. Within these business functions, machine learning excels in specific applications such as loss ratio forecasting, claim outcome prediction, policy cancellation, underwriting excellence, claims vehicle repair prediction, claims fraud detection, insurance portfolio investment allocation, insurance shareholder return optimization, policyholder cross-sell prediction, telematics data relationship exploration, and claims illegitimacy detection. Many of these applications are used within an insurance context by using a combination of structured data and unstructured data using the infinite capacity and speed of cloud computing.

3.5 4.2. Natural Language Processing Natural language processing (NLP) is a subfield of AI tasked with processing and understanding huge collections of structured and unstructured language data – such as text, speech, video transcripts, and more. While the earliest NLP efforts focused on translating text data between languages, more recent advances in deep learning, big data analytics, and cloud computing have expanded the potential of NLP, which is now being applied to various industries including financial services and insurance for customer service automation, sentiment analysis, and predictive analytics. Given the insurance industry's growing emphasis on improving customer engagement and closing the "service gap," which prior research has shown is a source of dissatisfaction for many customers, the evolution of AI-enhanced technologies such as NLP could hold promise when it comes to advancing group insurance solutions through enhanced data architectures that use intelligent automation. The industry has also witnessed a shift towards a more personalized approach with the advancement of insurance technologies driven by the changing customer expectations.

Equ 2 : Premium Optimization Equation

$$P_i = \alpha \cdot \hat{R}_i + \beta \cdot C_i + \gamma$$

- P_i = Premium charged to group i
- $\hat{R}_i$ = Predicted risk score (from Eq. 1)
- C_i = Cost of service or benefits expected

3.6 One key finding in the research is that NLP – alongside other critical technologies such as machine learning, big data analytics, chatbots, and robotic process automation – is primarily perceived by insurance executives as transformational rather than transactional in its impact on customer engagement. NLP can be an important asset for increasing customer interactions by letting customers easily ask questions and converse in their own words, via natural speech, while chatbots can facilitate 24/7 delivery. In terms of team engagement, NLP can leverage big data (especially voice conversations) to derive actionable insights on sales and service behavioral performance, improving both the employee experience along with overall productivity and sales/service effectiveness. For clinical engagement, the algorithms of NLP examine coded and uncoded clinical event data in member utilization records, extracting actionable detail.

5. Big Data Analytics in Insurance

3.7 The tremendous growth of data in recent years has given rise to a new form of modeling and more importantly, a new scale of insights generation. This shift from insight generation to a more coded modeling approach to insight generation on Big Data has put into focus the massive scale of data collection and storage capabilities that have been brought about by improved technologies. Much of the process of data collection, storage, and data cleansing has become a far more automated process than earlier, thus allowing researchers, agencies, and companies to spend less time and money doing this. This shift has thus captured the attention of companies, especially those in the business of managing people, resources, and innovation, which is increasingly the case with companies relying heavily on individuals on a sustained basis to remain relevant and successful. The insurance industry has become increasingly fond of such data collection capabilities and the advancements available.

3.8 Over the past decade, the insurance industry has made huge strides in building and harnessing the capability of Big Data analytics to meet the ever changing internal and external needs for insights and predictions to support strategy, process, and operations – key areas of a business' functioning. In the insurance business, large data sets make it possible for insurers to identify and group together risk pools and assign them to the correct price point relative to their future cash flow activities with respect to premiums paid versus loss occurred and expenses incurred when risk is triggered over the future course of the policy issuance. The scrutiny with which these ratios such as Loss ratio and Expense ratio as a function of premium and claim amounts are done too makes the effective and efficient functioning of Big Data support structure warranted.

3.9 Over time, insurers have pooled and built together vast amounts of actuarial, customer usage and behavioral, and company supported service improvements and systems running interaction data that influence insurance policy life at each sub-stage of the life cycle of a policy. The advent of big data analytic capabilities has led them to seek to make predictive analytics early on in the partnership working life cycle and even early in the customer journey. Insurers can track usage data at virtually real time during the life cycles of both policy and partnership and can assess the interaction, relationship, and route to marketing that the customer is most likely to pursue.

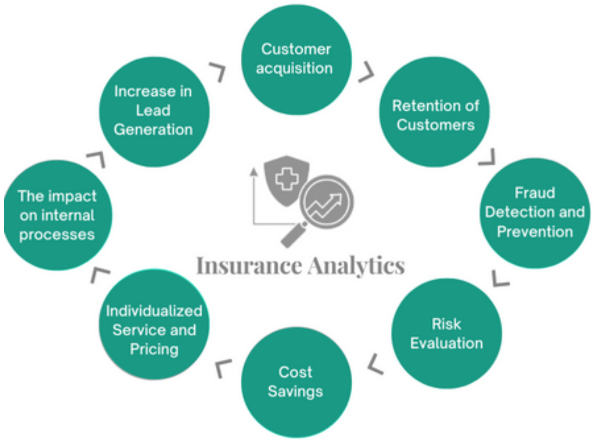

Fig 3: Big Data Analytics in Insurance

3.10 5.1. Data Collection Techniques

Increasing digitization of business processes generates enormous amounts of data from diverse resources. Information stored in various systems across an organization, as well as procurement data, capital market data, think-tank data, and other elements, need to be in readable format and need to be correlated with other sources and suppliers to be useful in risk management. While elaborating Big Data solutions, it is imperative to identify data collection techniques, apply data preparation methodology, obtain data, cluster, cleanse and tag data elements, and create a data warehouse. The following paragraphs explore approximately 24 big data sources and describe selected ones. One of the challenges in implementing insurance Big Data solutions is to use the wealth of available data in innovative ways to create incremental value. This requires a well-designed data collection technique. The first step is to identify Big Data sources that could have input into current and future risk models. Sources of interest include demographic data, historical data, related financial instrument data, industry data, operational data, and event data. The key to success is to analyze, document, and establish costs and benefits of implementation resources for all areas where the data collection methodology has not yet been implemented. Based on a thorough analysis, the organization could rank Big Data sources by ease of implementation and importance and then implement a filter to cleanse, deduplicate, and tag these data sources in preparation for creating a data warehouse and developing risk models on the warehouse properties.

3.11 5.2. Predictive Analytics

While predictive analytics has naturally found its way into insurance operations due to the availability of immense information resources, underwriting was among its first uses. Predictive modeling allows insurers to calculate the probability of future loss, enabling insurers to price the inclination of loss accurately along the risk distribution and to favorably spot favorable risks and assign lower premiums. This helps to improve the company's profitability, by emphasizing the true risk; therefore, it is a fundamental function of insurance. Furthermore, predictive modeling has also benefited the areas of retention and marketing. The faster the insurer is able to identify customers who are willing to quit and are more profitable, the quicker it can take actions to reduce these losses. Thanks to increased computing power and the availability of varied data sources that are more abundant and low-cost, rapidly evolving technology advancements make predictive analytics possible not only for the larger companies, but also smaller organizations. With risk modeling becoming increasingly important in pricing decisions, as actuarial prediction is now available to all insurers, it becomes more important for each company to have its own edge to be more accurate than the norm and to favorably differentiate risk classes. Moreover, competition pushes companies to charge optimum rates to remain economically viable, while being low enough not to face competition from its rivals. Insurers that embrace predictive analytics and set up intelligent analytics data systems are the only ones that would survive in the longer term. This need to optimize price and develop intelligent risk models, packed with differentiating features, has gained urgency with capital providers establishing offshore companies, able to offer better pricing on a real-time basis.

4. 6. Integration of AI and Big Data

4.1 This chapter discusses how having unique data insights in the group insurance domain enhances the power of algorithms and effortless usability of claims and enrollment platforms. Our discussions highlight the synergy between AI algorithms and data architecture while building group insurance solutions.

4.2 AI algorithms are just a part of the machine learning stack, which requires problem definition/modeling, exceptional quality input data, top-notch data pipelines, and scalable execution/design as part of an integrated system to yield sustainable results. Therefore, the group insurance ecosystem needs to think about implementing solutions that have a dual architecture to derive sustainable value using AI: the AI algorithm architecture should take advantage of existing data intelligence themes, and then continuously enhance the data architecture using the audacity of insights based on the AI vision.

4.3 A few key areas in the domain stand out with actionable synergies between AI and data-enhanced architecture. Firstly, the expected advanced AI use cases are solely focused on claims adjudication: Payment prediction, fraud identification, user custom experience, concierge chatbots/scripts, and potholes predicted leading to an improved experience. Getting further insights from NLP scripts and using transparency-led dashboards for adjudication and BI are less expected as of now, but will surely, in phases, be part of the group platform roadmap. The second key architectural area is the usability of solutions led by user experiences/engagement. All group insurance stakeholders' experiences are unique, diverse, and specific at the various journey touchpoints.

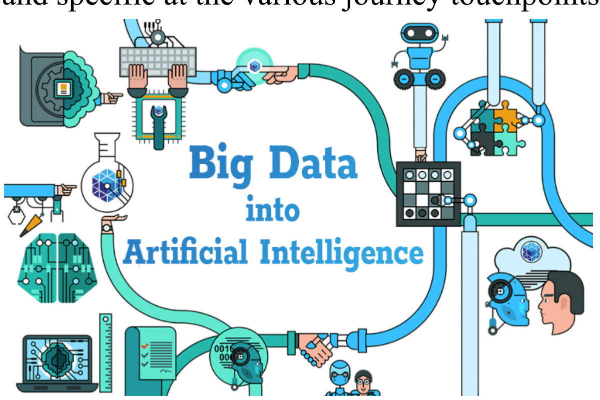

Fig 4: Big Data into AI -

4.4 6.1. Synergies Between AI and Big Data Artificial intelligence (AI) and big data technologies are developing rapidly. Big data technologies have made a huge volume of disparate data assets cost-effective to store, manage, and analyze. AI technologies, particularly sophisticated machine learning algorithms, have become capable of quickly and accurately extracting insights from big data. Increasingly, the two areas are coming together. Researchers are using AI to solve difficult problems associated with big data systems. And big data systems are being used to make AI more accessible and impactful across all sectors of the economy.

4.5 AI and big data are complementary. Big data fuels AI development by enabling the huge amounts of data required for AI algorithms to achieve a high level of accuracy. Big data technologies make it affordable to gather, clean, prepare, and curate this data. AI algorithms also are being deployed in big data systems to enhance their effectiveness. The combination of advanced AI with big data enables more efficient storage, retrieval, organization, and manipulation of large amounts of information. AI can identify which data is most relevant to decisions, recommend possible actions, validate data correctness, and increase the speed and reliability of processing. In real-time systems, AI supported decisions can drive a business process based on constantly changing incoming data. By augmenting human capability, AI also can allow the users of big data systems to extract better insights. More broadly, AI and big data have combined to create intelligent systems capable of automating decision-making in a wide range of subject areas, including healthcare, consumer products and services, travel, and transportation. Many of the firms exploiting these intelligent systems are using them to revolutionize business models across diverse sectors of the economy.

4.6 6.2. Case Studies This section describes two case studies illustrating how AI-enhanced technology architectures and Big Data can be used to create solutions that advance group insurance. The first study concerns AI's ability to streamline the insurance onboarding process by using pre-existing knowledge to inform underwriting and risk assessment. The second case study highlights how Big Data's potential to increase insurance product innovation can be realized through micro-level data sharing on participants' policies and claim history.

4.7 The onboarding process is vital to the insurance business. The onboarding process is how carriers and brokers introduce customers (or customers' employees) to the insurance world. A vital function of onboarding is making sure that customers understand their benefits package and how to make use of it. A typical service model for onboarding consists of one or more meetings wherein group benefit brokers meet with customers one-on-one. This process can be painstakingly labor-intensive, especially in a language barrier, multi-state scenario consisting of many subsidiaries/groups — each with a unique demographic profile and distinct level of need for assistance in understanding plan details. To partially automate the onboarding process, an onboarding bot (a "chatbot," or conversational AI system) was developed that effectively serves as an intermediate consultation stage. The bot engages users in dialogue, answering their questions about the insurance benefits package and helping them navigate their way through the various offerings in the intricate matrix of options.

4.8 Benefits from deploying the bot for benefits onboarding include (1) automation of the process, which reduces the carrier or broker labor required to conduct the onboarding, (2) increased accuracy in identifying employee needs, expressed through messages exchanged by the employee and the bot, and (3) employee education about available options and procedural steps. By applying recording, flagging, and tagging techniques - preconfigured to understand the specific nature and intent of messages about various benefit lines, the system can (1) detect if the question was answered, (2) detect if an employee is confused, (3) detect if the answers provided were not clear to the employee, or (4) recognize if the employee saved the conversation because they understood the answer.

Equ 3 : AI-Driven Customer Segmentation (Clustering Model)

$$S = \text{argmin}_S \sum_{i=1}^{N} \|X_i - \mu_{s(i)}\|^2$$

- S = Set of customer clusters
- $\mu_{s(i)}$ = Centroid of cluster assigned to customer i
- X_i = Feature vector for customer i

7.

Technology Architecture in Insurance Solutions

4.9 Insurance Solutions today align with technological advances, often in a Cloud Microservices based environment, enabling easy integrations with other solutions in the Architecture Adapter model. The integrations could enable high transaction volumes within pricing, onboarding, and service functions that are usually bottlenecks in an otherwise reasonably predictable business. Insurance solutions today bring a technology architecture that creates a digital ready enterprise-focused set up, taking care of their counterparties – the policyholders, agents, and insurance partners. This Partner-centric architecture reduces complexity for the partners as they interact with more than one market participant on a regular basis. This technology architecture today focuses on infrastructure enablement to deliver 99% or above availability of transactional processing. The other parameter of this infrastructure is to ensure that it is prepared to accept Digital data both on the human request and from Sources like IOT in case of sensors and policy servicing. This digital data flows into a Digital core that residing on the least variable but volume-intensive areas of insurance transactional data, still is a part of the low variable universe and gets amplified with the Big data-driven Analytics for the carrier and industry, ensuring the continuous business that insurance carriers engage in for their policyholders and investors. Cloud Computing has an important value proposition for a Data-Driven Digital Core. The technology architects for insurance Technology today promote Cloud solutions for data on Cloud. The Cloud today has a near-zero cost for Data Storage, and with the predictive capabilities embedded in AI models of Big Data solutions of the future, organizations migrate data to Cloud for Analytics, while keeping the Transaction data core with its near-zero transactional volume, with the Core applications.

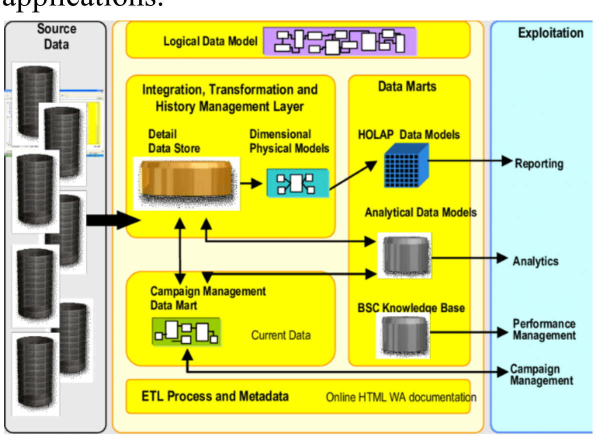

Fig 5: Insurance Intelligence Solutions

4.10 7.1. Cloud Computing International Insurance and Reinsurance companies have the technological capability to connect and engage with policyholders using simplified paths through various digital channels. A Cloud computing platform can be utilized to forge a seamless connection between internal GAP system endpoints and the insurance consumer ecosystem built by an insurance company, policyholders, and their many touchpoints, including consumers, brokers, and other third-party service providers. Such a connection is the portal to the rich sets of Big Data insights that enhance all aspects of Group Insurance products and solutions, from new product development to underwriting to pricing to claims processing and service to loss management and claims mitigation. A Cloud computing infrastructure also facilitates advanced analytics. Whereas present-day consumer device software does most of the analytical heavy lifting required for insurance real-time pricing and urban areas for other functions such as attribution modeling and prediction of loss severity and frequency, future Cloud computing architectures will allow much of the analysis to be performed centrally. Major computing tasks requiring large data sets to be processed can leverage the tens or hundreds of thousands of Cloud computing processors organized into a single, high-performance unit. Cloud-based technology architectures will thus support the ambitions that Group Insurance companies have to augment traditional product development, underwriting and pricing, and claims service resources with the complementary capabilities of statistical and predictive analytics. Cloud computing can allow the working lives of Group Insurance staff to be enhanced and accelerated using the voices of the consumers programming for the programming of insurance products and their development in the context of a transformational consumer engagement system.

4.11

4.12 7.2. Microservices Architecture Imagine we are buying a car: we go to a manufacturer and choose the model. He assembles it with parts from different suppliers that may be different. Porcelain bathtubs, plastic components and forged aluminum are combined on the same car. These pieces may respond to different life cycles. If the air conditioning compressor breaks down, we can change it without having to change the entire car. Insurance systems have been architected in a similar way. But that's history. Whoever wants to sell a car today must have all the parts made by himself or a manufacturer. Self-respected manufacturers no longer sell components to others. One or several modules, called platforms, are in charge of managing the entire orchestrated interaction. The communication between each module reinforces the value of the entire unit instead of adding value to a particular part of it.

4.13 Time has passed and the microservices architecture and the distributed ledgers have made their once glorious second level again give up lead. Microservices architecture was proposed a decade ago to face the development of applications that could be connected to each other to integrate through Data Orchestration processes, managed by a new API choreography pattern. The focus was on decentralization applied to the development of complex systems. Deep Data management and the decoupling of processes allowed the incorporation of new functionalities at a very low cost. Blockchains, designed to reduce the need for trust in peer relationships, allowed distributed data management, governed by protocols. This new layer of security, data accessibility, and transaction management regulation allowed access to data from multiple sources without managing synchronization processes to solve the fear of synchronized data not being the same at the same time.

5. 8. Regulatory Considerations

5.1 The rapid adoption of new technologies often compels regulators to assure the public that existing regulatory structures are adequate. Adopting an AI-enabled architecture or leveraging vast sources of data for BDA raises a plethora of concerns to which regulators must respond. Compliance with the government-approved use of BDA data for targeting clients may unintentionally violate Fair Housing Rules when using AI-enabled predictive analytics. It stands to be an interesting set of problems for agencies, their decision makers and ultimately the courts to resolve. Such a path requires developing a trust framework – clear data governance policies will engender consumer trust. As data becomes more central in the ecosystem, unanswered questions about its responsible use abound. Ethical gatherings should help clarify the fair use of predictive analytics by requiring that consumers be heavily protected from unforeseen events or consequences that occur as a result of using their data. What happens if a customer is mischaracterized by an algorithm that optimizes for price or premium or is targeted for a product for which they do not qualify? Foundation models central to generative AI show that large data sets can often lead to disquieting results when it comes to ethics and responsible use. The insurance ecosystem has often been on the defensive about their reliance on sensitive data disclosure with respect to their underwriting and pricing practices. The key to facilitating ethical use of BDA at the product development stage is to ensure that foundational principles are deeply embedded in AI engineering. Reinforcement learning is a tool that allows principled and responsive ethical anchors to be put into machine decision making. Uniquely, BDA provides a fact base not merely of what decisions should be taken, but how sensitive customers will be to particular product features and pricing attributes in respect of their data signing off.

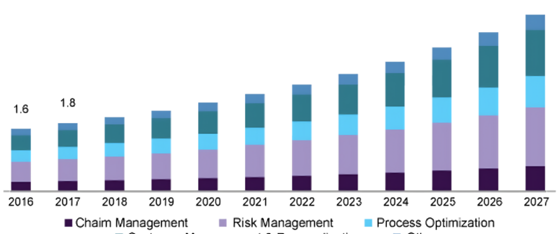

Fig 6: Insurance Data Analytics

5.2 8.1. Compliance Challenges

To date, regulators in some jurisdictions have issued no formal guidance or restrictions regarding the use of AI in the insurance context, though specific conduct requirements and prohibitions, such as the ones addressing unfair or deceptive acts or practices or discrimination, would apply. Other jurisdictions have indicated that they intend to issue additional guidance. For instance, one commission has stated that it would be providing more information for the use of AI to augment, improve, or automated underwriting, the primary area of impact of AI on the insurance industry. Still, others with rules governing the use of AI when determining eligibility, pricing, or underwriting are already trying to come up with specific enforceable rules. The rapid adoption of AI in connection with a variety of product segments widely concerns regulators from several jurisdictions that are leading to regulatory snarl. It sets off red flags from issues, such as whether using AI could result in breaches of privacy requirements while negatively impacting certain groups based upon race, national origin, or other descriptors often in violation of federal or state discrimination laws.

5.3 Most jurisdictions have issued consumer data privacy requirements. The latter aims to provide information about how consumer data is processed and used. Compliance with those rules will not only be cumbersome but will also lead consumers increasingly to inspect their data-sharing settings. All of this points to increased compliance costs for insurers. It remains to be seen how AI development and usage will adapt to frequently changing regulatory regimes and whether changing federal and state regulators could lead to flat-out restrictions on the use of AI, as are already being levied against certain companies and what implications those restrictions, if they eventually come, would have for growing or consolidating the use of AI in the insurance sector.

5.4 8.2. Data Privacy Issues Although most regions have, or are in the process of developing, regulations relative to the management and cross-border transfer of data, there is no universally applicable standard. This may create issues with more specifically pinpointing obligations under investigations or lawsuits regarding how a technology is deployed and how content is utilized, which ultimately may thwart innovative machine learning initiatives. However, there are attempts to create consistency through various regulations not limited to but including the Protection of Personal Information Act applicable to South Africa, the General Data Protection Regulation applicable to the European Union, the UK General Data Protection Regulation applicable to the United Kingdom, the EU-U.S. Data Privacy Framework enforced by the United States Department of Commerce in cooperation with the European Commission, the California Consumer Privacy Act of 2018, the Virginia Consumer Data Protection Act, and the Illinois Artificial Intelligence Video Interview Act.

5.5 The data privacy implications of these laws can be addressed by leveraging solutions with built-in privacy by design such that sensitive input data need not be stored or transmitted and thus completely eliminating the risk of exposure. Even so, breaches are still possible whether by hackers or by other employees through privileged access, and various policies must be implemented to mitigate data risk. Deep learning specialists must also be cautious regarding model sharing as access to other sensitive users' data could result in reverse engineering of the model weights and subsequent exposure of non-consensually shared sensitive data.

6. 9. Conclusion

6.1 In conclusion, agents and brokers within the Group insurance distribution market face the ongoing challenge of advancing business performance against a backdrop of significant disruption. To help navigate the changing marketplace, the adoption of AI-enabled technology architectures combined with enhancements offered through Big Data insight delivery can drive material business performance improvements in workplaces and in Group benefit plans. A carefully architected integration between multiple pools of claim data, statistical predictive talent, and intelligent AI models can help Business Partners and Brokers to move from retrospective analysis of Group plans and Business Partners' workplaces to prospective forecasting of how people, claims, and costs are likely to change in the future, by Group client, Division, and by occupational Function. It can additionally enable the productive matching of specific benefits and enhanced investment options and services to the Group's unique needs.

6.2 Technology Architecture, Advanced Predictive Talent, and Data Engineering alone cannot deliver value for Business Partners, their clients, or the Group Benefits industry at large. The implementation of this vision must occur within the context of coherent Business Partner, client and Group stakeholder alignments, Collaborative Governance, Design Thinking for Benefits, and the co-creation of a unique portfolio of offerings that drive employee Connection. Achieving enhancements in Connection within at-risk employee segments serves to drive Delta Return value as wellbeing levels are restored or improved over time.

6.3 In summary, through a combination of predictive planning review cycles and the exposure of personalized predictive insights, the Group Solutions industry can lead Business Partners and employers to unique positionings that ensure that the Value created by all Channel stakeholders is both sustainable and enduring within markets undergoing major upheaval.

6.4 9.1. Future Trends

Customers have come to expect more from their service providers. In insurance, this expectation translates into a desire for personalized, immediately actionable recommendations across the insurance value chain, including plan selection and promotion, customer acquisition, service and retention, fraud detection, underwriting, loss prevention, and claims management. Advances in the use of AI and data analytics can permit life insurers to create systems capable of meeting those expectations, providing the customized recommendations customers expect and enabling insurers to proactively and without effort deliver those recommendations where needed, when needed. Hyper-personalization of insurance products and services as well as sales and service processes and efforts is moving beyond product discounts. Real-time recommendations based on the customer’s existing risk factors presented at the moment the customer engages with the insurer offer the prospect of not only fostering customer loyalty but also reducing loss ratios by improving customer risk awareness and action. Proactive policy alerts can warn customers to take immediate actions that eliminate or reduce risk in exchange for a more favorable estimation for their existing insurance risk profile. Additionally, profile-based recommendations offer new, existing, and potential customers guaranteed underwriting pricing advantages on new policies or policy changes that avoid selected medical conditions, activities, or geographical regions. By automatically monitoring their risk factors, customers can receive real-time notifications to avert increased negative risk exposure and related unfavorable premium adjustments. Intelligent claims systems leverage AI to streamline simple, low-hassle claims processes while leveraging people to handle larger and more complex claims that require empathy and greater discernment for proper settlement. Ultimately, great customer-oriented advanced life insurance systems designed around lower service and processing costs offer a win-win equation to raise life (and health) insurance participation rates, lower rates for life and health insurance products, and reduce the levels of underinsurance and uninsured individuals.

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