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Original Article

Automating Claims, Policy, and Billing with AI in Guidewire: Streamlining Insurance Operations

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Abstract *- Artificial Intelligence (AI) impacts on the insurance platforms are realigning how established firms handle business, deliver better services, and reinforce the decision-making process within the organization. Guidewire is a Property and Casualty (P&C) insurance industry-leading software solution that applies AI technologies to automate primary activities that include billing, claims management, and policy administration. This paper examines the architectural design, functional modules, and pipelines that facilitate AI automation in the ClaimCenter, PolicyCenter, and BillingCenter of Guidewire. Insurers will achieve real-time claim resolution, dynamic risk underwriting, intelligent underwriting, and predictive customer behaviour through artificial intelligence features, including natural language processing, machine learning, and predictive analytics. In addition to minimizing operational overheads and chances of fraud disasters, such capabilities are accurate and effective and in addition, they offer customer satisfaction. Continuous model learning approach, a driver of intelligent automation, as well as the incorporation of internal and external data sources and real-time inference pipelines is discussed in the paper as well. Moreover, this is also evaluated about some of the challenges such as legacy compatibility, regulations, ethics, and workforce adaptation. A detailed examination of the business implication shows that the ROI, scalability and customer retention is all considerable. Future directions in research are also created in the paper like hyperautomation, generative AI, and adaptable insurance platforms. In conclusion, this insight underlines that Guidewire is a powerful agent of smart digital change in the insurance market.*

Keywords *- Artificial Intelligence, Guidewire, Policy Administration, BillingCenter, ClaimCenter, PolicyCenter, Predictive Analytics.*

1. Introduction

The insurance industry is in the middle of a paradigm shift as it has experienced an enormous change due to the effects of new technologies. One of them is Artificial Intelligence (AI), and it is viewed as a game-changer that can provide enormous leaps in speed, precision and the efficiency levels of the operations. There is also an upward trend where insurance companies settle on the use of AI to be more efficient, reduce costs, and enhance customer experiences. [1-3] A prime example is seen with Guidewire, a large developer of Property and Casualty (P&C) insurers software, where it has embraced AI to revolutionize core functions of an insurers enterprise warranting claim processing, policy administration, and billing. Some of the AI-related technologies present in Guidewire products are machine learning, Natural Language Processing (NLP), and predictive analytics that can be attached to their core platforms (ClaimCenter, PolicyCenter and BillingCenter) to ease complicated workflows, uncover trends, and aid with data-driven decisions. To take one example, slow processes associated with holding up the processing of claims (e.g. high number of claims and tendencies to commit fraud) could be optimised by means of intelligent triage, automatic document review and anomaly discovery. On the same note, AI policy administration allows timely underwriting, near products, and improved risk grading. The use of artificial intelligence to make predictions, analyze tendencies in payments, and other proactive collections supports the task of billing.

AI will allow it to reduce response time and operational overhead as well as improve the customer experience by making services faster, more accurate, and transparent due to integration with the Guidewire ecosystem. However, AI implementation is not without challenges, such as problems with data integrity, integration, and compliance. In the paper, the writer will analyze the opportunities and challenges that AI presents to the insurance lives using the case of Guidewire and provide an overview of how it is possible for the insurance firms to future-proof currently operating processes and enable them to remain competitive and meet the evolving and digitalized market demands.

2. Guidewire Architecture and Functional Modules

2.1. Overview of Guidewire Platform

Guidewire is a software package specific to the insurance industry that serves the Property and Casualty (P&C) insurance sector with a collection of products seeks to offer a single perspective on the essential insurance procedures. The platform is

modular in nature which allows insurers to digitise business processes end-to-end throughout all lifecycle stages of the insurance process like underwriting processes, policy administration processes, claims management processes, and billing processes. Guidewire is a very large, scalable and interoperable software platform that can be used by any type of insurer, irrespective of size or complexity. [4-6] Other than the cloud compatibility, the platform is also capable of running both on-premises and cloud platforms, offering flexibility to diverse IT based environments. Guidewire at its core is implemented with a Service-Oriented Architecture (SOA) and is implemented as Java based technologies, and this helps in offering a flexible model of extensibility, security and performance.

2.2. PolicyCenter, ClaimCenter, BillingCenter

The functional modules within the Guiding Wire platform are PolicyCenter, ClaimCenter and BillingCenter. Such modules may be used in a fully integrated environment or a standalone one.

- PolicyCenter is the tool that has been used to accomplish the entire life cycle of the policy lifecycle functions through quoting, underwriting and policies. It helps launch products quickly, ensures regulatory compliance, and maximises the accuracy of underwriting.
- ClaimCenter is an automated system used to manage the claims lifespan, covering first notice of loss (FNOL) to settlement. It has capabilities for intelligent task assignment, fraud detection, and claims analytics, and can process the volume rather quickly, thus enhancing customer service.
- BillingCenter is also the company that handles premium billing, receivables, and payments. It utilizes various billing procedures, allows predicting payments, and provides real-time insight into monetary transactions. The modules come as a package and contribute towards a seamless experience along the insurance value chain.

2.3. Integration Capabilities (APIs, Data Hubs)

Guidewire is designed to be highly integrated, enabling it to communicate effectively with external systems and data sources. The platform is represented by strong RESTful APIs and SOAP web services, enabling insurers to integrate with other third-party application services, including CRMs, document management systems, and data enrichment tools. Guidewire also provides integration accelerators and a Digital API Layer, which eases the development of custom portals and mobile apps. The Guidewire DataHub and InfoCenter also facilitate the use of advanced analytics and business intelligence because they centralizes and organizes enterprise data, making it easily available and accessible. These tools enable real-time data sharing, reporting, and decision-making, forming the basis of automation driven by AI.

2.4. Customization and Configurability

A high level of customization and configurability is one of the main characteristics of Guidewire. Insurers have the flexibility to customise workflows, business rules, UI, and data models according to their operational and legislative needs. To support configuration and integration, Guidewire Studio is used as a development environment to enable existing applications to have their behavior and appearance modified without touching underlying code to maintain product upgrade compatibility. Elements that can be configured are policy forms, claims procedures, billing cycles, and underwriting criteria. This flexibility enables insurers to react swiftly to market dynamics, introduce new products with minimal IT interference, and coordinate systems with business strategic plans.

3. AI-Powered Automation in Claims Handling

3.1. Claim Intake Automation

Claim intake, the first stage in the claims process, is a labor-intensive process that lacks automation and requires data to be manually transferred across systems, documents to be scanned and keyed using manual data entry, and customer contact. [7-10] AI can facilitate this stage with a considerable reduction of workforce of support staff as they are able to accept intake via chatbots, online forms, and Natural Language Processing (NLP). In Guidewire ClaimCenter, AI-based tools are capable of extracting pertinent information from multiple types of data, including voice recordings, images, and documents provided by the claimant. The capability of Optical Character Recognition (OCR) and NLP enables unstructured data to be turned into structured, usable input in a fairly short time, which saves the energy and time of adjusters. Such automation not only accelerates the claim registration process but also makes it more accurate and convenient, reducing delays and human error in the registration process.

3.2. AI for Fraud Detection and Risk Assessment

Insurance fraud is a big liability to the insurers amounting to losses in business and destruction of confidence. AI improves the investigative skills of detecting a fraud by taking cognizance of historical information and trends and processing anomaly indicators in real-time. The machine learning algorithms implemented in ClaimCenter have the potential to elevate the manipulative claims, which would signal inconsistencies or anomalous trends or similarity to previously encountered instances of

fraud. The systems undergo learning and evolve and the detection gets much accurate as these systems evolve. It also stands to reason that AI could help in the process of risk assessment, which gives one an idea of the scope and magnitude of the claim, and thus helps insurers prioritize and separate cases more effectively. This maximizes the use of investigative funds and the chances of paying fraudulent claims is still minimized.

3.3. Decision Support and Claims Adjudication

Another area where AI proves significant is in claim adjudication; this is significant in settling claims and determining the claims at hand. The use of AI-based decision support systems can analyze different types of datasets such as claim history and policy-related data, medical reports, and third-party databases used to propose the necessary action. These systems can recommend the amount of settlement, approve routine claims without manual intervention, and identify exceptions that require human verification. AI in Guidewire ClaimCenter guides and informs the adjusters towards quick, even, and fact-supported decision-making. Automating monotonous adjudication operations and providing control over complex case assessment, AI can dramatically reduce the pace of processing, increase or even improve its accuracy, and ensure its alignment with regulatory and policy directions.

4. System Architecture for AI-Driven Insurance Automation

The process of embedding artificial intelligence in the fabric of Guidewire core modules (ClaimCenter, PolicyCenter, or BillingCenter), along with a focus on the enabling ecosystem of external integrations, data services, and governance processes. [11-14] The proposed system is based on the AI-Enhanced Guidewire Core that is located at the core of the system, with AI models that drive individual functions like automated claim triage, risk-adjusted policy pricing and predictive billing insights. These functions seamlessly integrate with AI services, including historical insurance data lakes, feature engineering pipelines, model training components, and inference API services, enabling real-time incremental inference. This intimate integration of business logic and machine learning models allows real-time smart decision automation throughout the insurance life cycle.

Additionally, the architecture emphasises the importance of data governance, security, and explainability. The security and monitoring layer guarantees compliance by introducing role-based access controls, auditing services, and mechanisms to ensure that models are interpretable. Customers are connected through various communication mechanisms (email, SMS, chatbots), and third-party/external connections will enhance data inputs and increase the accuracy of the models (telematics, regulatory APIs, and risk sources). Altogether, this architecture will not only speed up operational efficiency but also support a transparent, scalable, and compliant AI implementation framework for the insurance software ecosystem provided by Guidewire.

5. Intelligent Policy Lifecycle Management

5.1. Underwriting Automation with AI

Traditional underwriting practices are evolving with the aid of AI, as the decision-making process is becoming faster, more accurate, and more consistent. [15-17] Guidewire AI-driven underwriting engines within PolicyCenter can analyze massive volumes of both structured and unstructured data, including past claims and risk data, third-party, telematics, and behavioral data to evaluate risk and eligibility. Machine-based learning algorithms can also be trained on the same data. As such, they can be used to generate decisions on a specific entity within a shorter period compared to a human-based underwriter, without compromising accuracy due to pattern avoidance. Automated rule engines, additionally, automate this procedure, meaning that predetermined criteria are used to automatically approve the standard cases and send the more complex ones to human underwriters as they review them. The hybrid model can improve the turnaround time, decrease the operation expenses and compliance with the regulations.

5.2. Dynamic Pricing and Risk Modeling

The contemporary insurance plan centers on dynamic pricing, and such pricing can be combined with AI and on-the-spot risk modelling. Guidewire AI functionalities portray the ability to review and change premiums continuously following the risk profile of a customer. AI models make use of predictive analytics to estimate price using location, occupation, driving behaviours, claims history and the ability of macroeconomic drivers to predict risk-adjusted prices. Additional improvements of these models can be made with the introduction of near-real time data captured by telematics or Internet of Things sensors, which will enable insurers to price competitively and reflectively on the near-real time assaults on the risk at hand. The capability increases the profitability and ensures justice and transparency in calculating premiums.

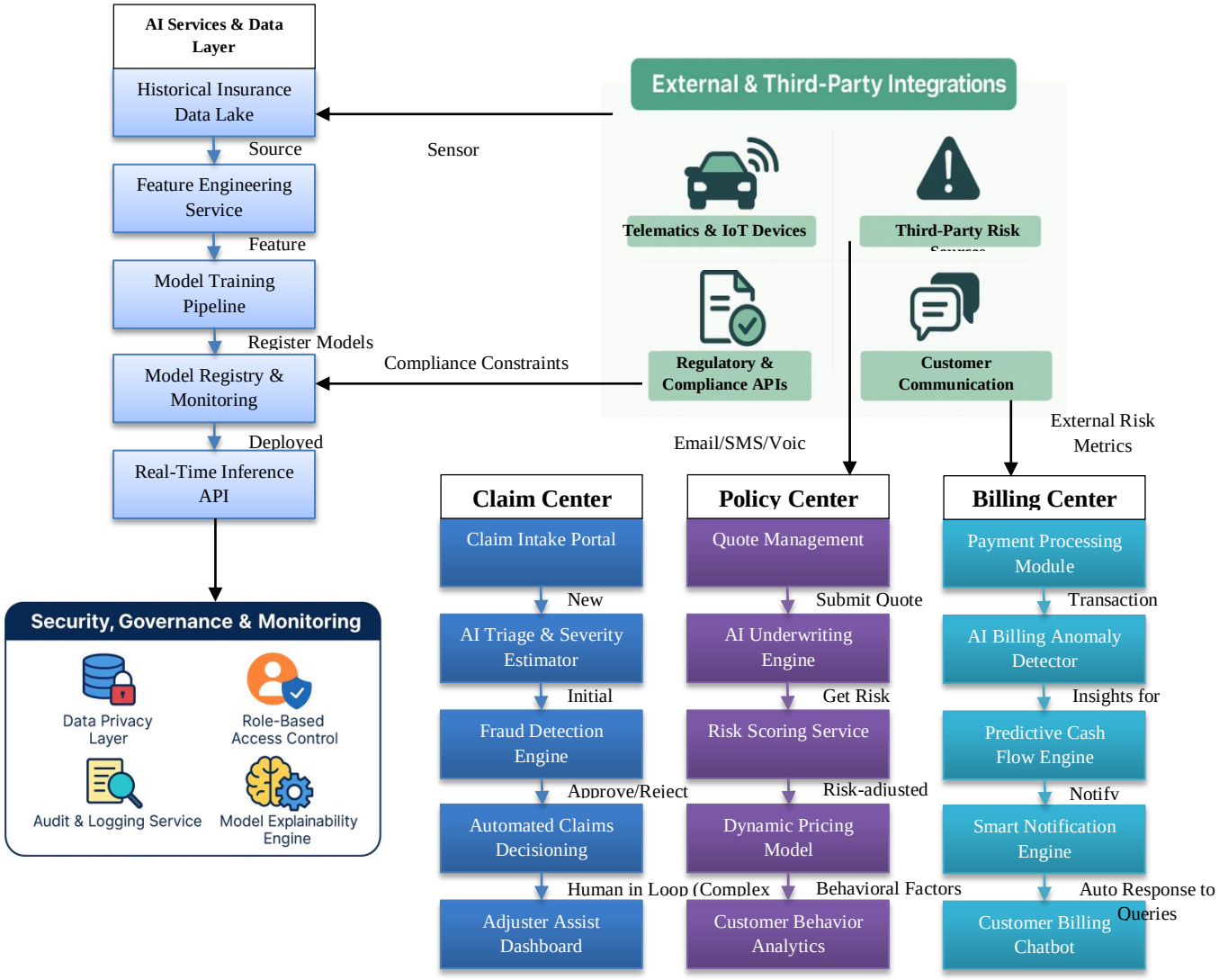

Fig 1: AI-Driven Insurance Automation Guidewire Architecture

5.3. Customer Behavior Prediction

Insurance and targeted marketing require understanding and predicting customer behavior. Guidewire AI uses behavioral analytics to detect patterns, including how likely to renew, how many claims to file, and how responsive communications are. The insurers can proactively intervene by analysing interaction data, payment history, and lifestyle indicators to predict the actions of their customers, such as lapses or upsell opportunities. Customer segmentation can also be implemented in predictive behaviour models, allowing insurers to define their engagement strategies and allocate resources more efficiently. Such a degree of intuition creates better customer relationships and improves long-term customer value.

5.4. Personalization and Recommendation Systems

The customer market is becoming more customer-centric, and individual insurance products are getting more significant. PolicyCenter provides AI-driven recommendation tools that enable you to review historical data, preferences, and real-time information to determine the best coverage, riders, and discounts for each person. These systems have been compared to recommendation engines used in e-commerce, except that they are positioned to handle risk, regulatory, and compliance issues specific to insurance. Personalization can be applied to other areas outside product recommendations, such as communication preferences, billing frequencies and reminders to renew products. Such a degree of tailoring is not only likely to boost customer satisfaction rates but also to accumulate higher rates of conversions and policyholder loyalty.

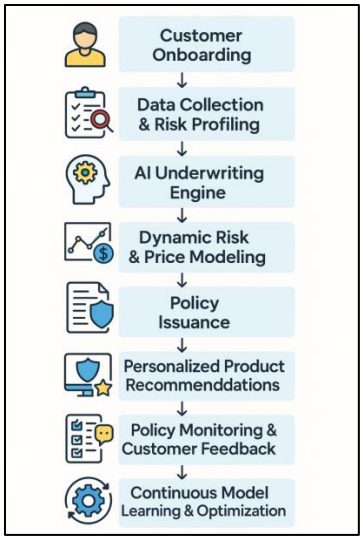

Fig 2: Intelligent Policy Lifecycle with AI

6. AI Integration in Billing and Payments

6.1. Payment Scheduling and Optimization

AI plays a major role in automating payment schedules by studying the record of payment, financial performance, and risk of the customers to suggest a compelling billing schedule to them. [18-20] In Guidewire, through BillingCenter, the machine learning models analyze tendencies of late payments, seasonal cycles of income, and modes of payment to provide real-time suggestions about schedules that are well-balanced with the financial behavior of the customer. This dynamic method enhances a more compliant payment process, reduces arrears, and promotes a straightforward billing experience. The insurers benefit from the improved predictability of their cash flow, while customers enjoy the flexibility and personalisation of their payments, which helps reduce financial stress.

6.2. Predictive Revenue Management

Predictive analytics is important in revenue management since it predicts future cash flows, indicates accounts at risk and even indicates where revenue may be leaking. Guidewire uses AI model which processes the operational data read ramified during transactions and contacts with customers and external indicators of economic development to make forecasts of billing results and act prophylactically. Namely, a reminder can be automatically created, the procedure of collections can be initiated, or it can offer a new payment schedule considering the anticipated behavior. Such proactive revenue management will assist the insurers in resolving financial stability and being agile to respond to the emerging trends without undermining efficiency and financial stability.

6.3. Anomaly Detection in Billing Transactions

Monitoring billing transactions for irregularities is key to avoiding fraud, billing errors, and non-compliance. Anomaly detection engines powered by AI in BillingCenter enable the tracking of a vast volume of billing and payment data to detect abnormal patterns, such as duplicate charges, incorrect amounts, or suspicious payments. Statistical baselines, thereby enabling real-time learning, have been applied to these models to identify outliers without pre-designed rules. On anomaly detection, it is automatically escalated to be reviewed or resolved so as to maintain billing accuracy, hence safety to the customer and the insurer against financial losses.

6.4. Conversational AI for Billing Queries

Repeating requests about billing is a common practice among customers, which can be easily processed using conversational AI. The AI-based chatbots and voice assistants native to the BillingCenter utility will answer frequently asked questions about due dates, payment options, instalment plans, and refund situations immediately. NLP-driven bots have the capability of accessing real-time billing data via API connections and provide personalized and reliable support. Furthermore, they are able to forward complex problems to human agents when necessary. This will not only enable the business to improve customer satisfaction by providing support around the clock, but also help decrease the call strain on customer service departments.

7. Data Pipelines and Model Deployment in Guidewire

7.1. Data Sources: Internal & Third-Party

The key to the successful integration of AI and Guidewire is the seamless aggregation of various data sources and their effective utilisation. Technically, Guidewire products, including ClaimCenter, PolicyCenter, and BillingCenter, generate large amounts of structured and unstructured data, such as claims history, underwriting decisions, billing transactions, and customer inquiries. On the outside, the system interacts with third-party data sources, including telematics and IoT databases, regulatory information databases, credit bureaus, and risk intelligence companies. These data inputs enhance the AI models into a more comprehensive form, such as creating a wider context and improved predictive accuracy. For example, data gathered by vehicle telematics can enhance the assessment of claims, and external credit scores can also aid in billing risk estimation.

7.2. Model Training and Continuous Learning

Guidewire supplies an extensive AI lifecycle, with model training, validation, deployment and learning in a continuous manner. Historical data, which is information about previous events, passes through the feature engineering services in order to come up with significant input variables to design the model. The training pipeline has a set of supervised and unsupervised learning algorithms to generate a custom model in any of the scenarios, such as detecting fraud transactions, worldwide pricing optimisation, or predicting customer churns. Once it is deployed, the models are continually feed new data to ensure that they change with new patterns and can enhance with time. The loop will play a critical role in ensuring that AI applications in insurance environments will be sustained and it can readily be adjusted to changes in demands.

7.3. Real-Time AI Inference Pipelines

The capacity to conduct real-time inference has enabled smart and swift responsiveness of automation across the life cycle of insurance. Guidewire architecture has an inference API, which is real time based and makes it possible to connect the deployed models with operating systems. Data may travel ClaimCenter, PolicyCenter or BillingCenter, and the AI models applied within these avenues may make predictions or decisions instantaneously (i.e., a risk score, a fraud warning, or a personalised price recommendation) within milliseconds. This pipeline of low latency allows insurance companies to develop intelligence and incorporate it into any critical process in order to respond to the process at the appropriate time and in appropriate context. It encourages mass, swift decision-making which is essential to digital-first customer journeys and frictionless operations.

7.4. Compliance and Data Governance

The execution of AI in insurance must have a high level of data privacy, ethical notions and mandates of auditability. Guidewire also enables a full data governance environment that combines role-based data access control, auditing and data privacy layer to provide secure and compliant use of data. In addition, the purpose of being explainable is also addressed in the platform with its internal facilities to allow the understanding of how and why a model has made a particular decision, which is a requirement in regulated environment. The training and deployment of a model is also conducted with compliance restrictions so that the results of the model will not result in discriminatory or prejudiced decisions. Such modality of governance will allow a just insurer to create trust, avoid regulatory trappings, and eventually promote responsible AI applications.

8. Business Impact and Operational Benefits

8.1. Efficiency Gains across the Value Chain

Combining AI with the Guidewire platform yields a significant increase in efficiency throughout the insurance value chain, including the generation of quotations and policies, settlement of claims, and billing. Repeatable and time-intensive activities, such as claim intake, underwriting reviews, and billing reconciliations, can be automated, resulting in a substantial decrease in processing time and manual input. Employees will be able to allocate more resources to highly valuable tasks by relying on AI-powered triaging, document retrieval, and decision-making tools, which help increase the overall output of their workforce. Through its efficiency and simplicity, work processes in PolicyCenter, BillingCenter, and ClaimCenter enable insurers to provide more effective and quicker operations, thereby streamlining their internal processes.

8.2. Cost Reduction and Scalability

The implementation of AI in Guidewire helps insurers reduce operational expenses by lowering the need for labour, shortening processing times, and limiting the number of errors. Dynamic pricing engines, automated claim adjudication, and predictive billing systems reduce the need for large administrative workforces, resulting in leaner operations. Also, Guidewire is designed to be scalable as its cloud-ready and modular structure, based on the AI-guided optimization of business processes, makes it adaptable. The platform is ideal in organizations that are either growing or are going through digital transformations, as insurers can embrace both new markets and larger transaction volumes without comparable increases in overhead.

8.3. Customer Satisfaction and Retention

The insurance market is experiencing a shift in customer expectations, driven by the need for real-time services, transparency, and personalised service offerings, which align with AI's strengths. The AI-powered solutions provided by Guidewire ensure the improved first-touch percentage of resolving and reduce the length of the claim cycle, besides enabling more personalized products to be offered. Chatbots, individuated policy suggestions and flexible billing terms provide a proactive customer service and personal customer service interactions. The customer-centric strategy would also help induce satisfaction levels and would result in the loyalty levels along with the long-term retention particularly among those more digitally savvy policyholders who have limited their time and attention.

8.4. KPIs and Measurable ROI

Not only can the investment done by Guidewire in AI integration be measured, but it is also meaningful. Performance improvement can be measured with the help of Key Performance Indicators (KPIs), such as processing time on claims, underwriting turnaround time, premium leakage, customer resolution rates, or the Net Promoter Scores (NPS). Guidewire users involving AI in insurance indicate a great ROI through efficient payouts of claims, minimized chances of fraud, and raised conversion spans. Moreover, predictive intelligence and real-time data analytics help insurers in making better business decisions making them more profitable and capable of taking decisions quickly in a strategic manner. The efficiency and worth of automation based on AI in modern insurance operations is supported by the fact that it has tangible positive effects in reducing operations.

9. Challenges and Risk Factors

9.1. Model Accuracy and Trust

The accuracy and reliability of predictive models are among the primary considerations when implementing AI in the Guidewire ecosystem. Machine learning algorithms have the potential to provide potent insights, but it is essential to never hide the fact that such algorithms can only be as effective as the data they are trained on. Improper or reduced input data may lead to inaccurate risk measurements, underwriting, or unjust claims. Additionally, certain AIs have a model called a black box, which makes it difficult for stakeholders to understand how a decision was reached. Such unexplainability can erode user, regulatory, and policyholder trust. Accuracy, validation, and explainability of models. The models should be accurate, valid, and explainable to remain credible and subject to reliable operations.

9.2. Regulatory and Ethical Concerns

Regulatory and ethical concerns are outstanding when dealing with AI applications in insurance. Prescriptive requirements include data protection regulations (such as GDPR and CCPA) and insurance regulations specific to regions where sensitive personal data is involved. Ethical concerns also emerge when race, gender, location, and socioeconomic status are discriminated against unintentionally by AI models- it can be against the fairness and anti-discrimination laws. Insurers are required to document, audit, and explain decision-making driven by AI in the financial sector, as regulators are growing concerned about algorithmic decision-making.

9.3. Legacy Integration Barriers

The incorporation of AI functionalities into pre-existing legacy solutions presents a significant technical and operational challenge. The use of legacy architecture and data silos by many insurers is far too slow to enable real-time processing. It is not designed to be easily interoperable with the latest AI tools. The implementation of IT transformation, data cleanup, and system reconfiguration may require significant investment in migrating to or integrating with the AI-enabled modules of Guidewire. There are situations where it can be challenging to retrofit AI capabilities into existing legacy architectures, which may derail implementation schedules and make them expensive. The management of these legacy obstacles requires planning, phased implementation practices, and partnership with experienced integrators.

9.4. Workforce and Cultural Shift

The implementation of AI technologies also requires the reformation of the culture and workforce of the insurance organizations. Workers can be afraid of losing their positions or adapting to new AI-facilitated workflows and decision-making processes. It is common to have reservations about trusting the recommendations of machines, particularly in positions where human judgment has played a prominent role, such as underwriting and claims adjudication. The solution to this challenge involves proactive change management, ongoing training, and upskilling programs to ensure that employees can establish effective collaboration with AI-powered systems. Adopting an innovation culture that supports innovation and human expertise will facilitate effective adoption and the achievement of long-term value realization.

10. Future Directions

In the further development of the insurance sector, integrating AI into important platforms such as Guidewire can only deepen and grow in both operational and strategic aspects. A significant future trend is the combination of generative AI with deep natural language understanding, which will enable an even more natural customer experience, automatically prepare documents, and process claims in real-time. The abilities will also minimize the need to use manual processing and improve the self-service experience. Moreover, edge processing and sensor connectivity in real-time, such as telematics in car insurance or smart home devices in property insurance, will continue to provide data to AI models that are much more adaptive, allowing policies to be tailored much better. The trend to hyperautomation is another new trend, with AI being used with robotic process automation (RPA) to generate automatic intelligent workflows without human intervention. The cloud-native architecture that Guidewire has implemented, along with the expanding ecosystem of AI partners, will play a central role in this transition. Insurers will also pay more attention to ethical AI governance, the explainability of models, and the clarity of decision-making to address the growing regulatory standards and demands. Lastly, adaptive insurance platforms where policies, prices, and customer experiences are optimized in real-time and continuously will emerge, and AI need not be treated as an aid only but as an innovation and differentiation driver in the insurance space.

11. Conclusion

Machine learning in the Guidewire is one of the radical advancements of insurance business in property and casualty. AI can make services smarter by automating business processes associated with claims processing, policy lifecycle management, billing, and more; hence helping streamline service delivery and create more personalised, intelligent, and rapid experiences with customers. Smart claim triage and fraud detection, dynamic pricing and behavior analytics are a few examples of the AI-enabled functionality in Guidewire that create gradable and transforming value across the insurance value chain. The above changes empower insurers to cut on the cost, attain high accuracy, and offer swift answers that satisfy market requirements. However, the road to a large scale usage of AI is not so rosy. Another obstruction that could be avoided or dealt with accordingly to have an effective implementation includes data quality issues, regulatory issues, labor divisional changes, and legacy integration. Nevertheless, strategic benefits of AI can be discussed as long-term ones, like improvement in the scalability, customer retention, and quality of decision-making process. These aspects render the future of AI a strategic necessity on the part of progressive insurers. The evolving technology and the possible commercial capabilities to conduct insurance business on a scale of imagination, there is no doubt that Guidewire is destined to usher in the next level of smart and data-driven insurance undertakings. Insurance companies going through such a transformation will not only create operational excellence but also acquire a sustainable competitive advantage in the market, which is slowly becoming more digitalised.

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