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Modernizing Insurance Systems with Java, Spring Boot, AWS, and AI: A Comprehensive Technical Framework

Sreelatha Pasuparthi
KSRM College of Engineering, India

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ABSTRACT

The insurance sector's systems currently experience significant challenges in modernization, which are caused by the monolithic systems developed in the older technology systems. This article outlines the technical approach to the modernization of insurance systems, which will require the effective utilization of Java, Spring Boot, and Artificial Intelligence technology. The article covers the domain-driven design approach, which will allow the software design to fit the domain of the insurance business, and the microservices design approach, which will break down the monolithic software systems into deployable units of software. Also, the article highlights the cloud development approach, which will take advantage of the elastic nature of the cloud and its various ready-to-use services. The article also highlights the technical approach to the implementation of the insurance systems' security, which will cover the authentication and authorization of the software systems, protecting the software systems from various threats, and the compliance of the software systems with various regulatory requirements, which will be required by the insurance systems to handle the insurance information of a sensitive nature. Other aspects of the article include the event-driven approach, which will enable the software systems to communicate effectively, and the Artificial Intelligence approach, which will revolutionize the insurance systems through the application of Artificial Intelligence technology. The article highlights the approach to the implementation of the software delivery of the insurance systems, which will include the DevOps approach, which will enable the software systems to be developed and delivered to the insurance market effectively and efficiently.

Keywords: Domain-Driven Design, Microservices Architecture, Cloud-Native Infrastructure, Artificial Intelligence Integration, Continuous Delivery

1. INTRODUCTION AND INSURANCE DOMAIN LANDSCAPE

The insurance sector involves intricate business processes that range from policy management, claims handling, underwriting, billing, and customer service. Domain-Driven Design focuses on developing a profound knowledge of the business domain and creating a ubiquitous language that eliminates semantic confusion between the technical and business teams [1]. Policy management is responsible for the entire life cycle that covers the quote, issuance, renewal, modification, and subsequent termination of insurance contracts. The contemporary policy management solution needs to factor in dynamic product structures that cover a wide array of insurance lines, including property and casualty, life and annuity, and health-related insurance. The solution needs dynamic rating engines that rate a charge based on factors, automated underwriting that determines insurability, and document management functionality that is capable of handling digital policy documentation [1].

Processing claims is the most customer-focused endeavor of an insurance enterprise, from the point of First Notice of Loss until the validation, investigation, adjudication, and settlement stages. Modern claims processing systems allow omnichannel handling capabilities such as web, mobile, telephony, and agent-assisted interfaces. The Spring Framework offers end-to-end support for building enterprise-level Java-based systems, such as dependency

injection, aspect-oriented programming, and declarative transaction support, for the implementation of complex business logics efficiently.[2] Automated validation rules will check the applicability of the coverage and the policy status prior to the submission of claims into the respective adjudication queues. Links with external service providers like car repair shops and medical providers facilitate the synchronization during the entire procedure for the resolution of claims.[2]

The underwriting process evaluates risk profiles and defines policy acceptance and rate decisions. The traditional underwriting cycle was intensive in terms of manual processing and reliance on human decisions. Contemporary underwriting systems utilize rule engines and predictive processing for fast-tracking decisions and preserving risk quality. The underwriting systems interface with credit reporting agencies, motor vehicle records, and specific data vendors for accessing complete risk information. The underwriting decision mechanism is required to provide thorough audit trails of all data inputs, decisions, and overrides for satisfying regulatory examination obligations. Domain-Driven Design tenets emphasize mapping computer code alignment along domain lines and promoting accurate domain representation in code by strategic and tactical patterns [1].

Billing and payment processing systems handle premium computation, issuance, payments, and collection processes. The system is capable of supporting a variety of premium frequencies, various payment options such as automatic clearing house and credit card payments, and customized payment terms. The integration with payment processors and banks is capable of processing payments in real time. Spring Boot is based on the Spring Framework with features such as auto-configuration, embedded containers for easier deployment, and production-level functionalities like health checks and monitoring that meet operational needs [2].

2. ARCHITECTURAL EVOLUTION: FROM LEGACY MONOLITHS TO CLOUD-NATIVE MICROSERVICES

Monolithic architectures are known to prevail in the existing insurance IT systems, which have been found to possess single-unit architecture designs with functional capabilities embedded in separate but intricately interwoven applications. Monolithic architecture designs create bottlenecks for digital transformations because an update in any of the functional domains requires performing comprehensive regression testing of the entire application. The release cycle can range from quarterly to semi-annual intervals because of modifications in more than one team. Scalability issues are anticipated because the entire application collectively needs to have its scalability addressed for handling an increase in the workload in instances when boosted demands are limited to certain domains. Obsolescence in technology emerges because of insurance products using computing paradigms through programming languages of past generation computing eras [3].

Microservices architecture effectively deals with these limitations by breaking down the monolithic applications into distinct services, each representing different business capabilities. Microservices architectural style is based on mapping the technology artifacts to business domains, thereby allowing organizations to organize their development teams according to value streams, rather than focusing on the technology stacks. Each microservice has a data model, business logic, and application programming interface contained in it, allowing it to work like an autonomous system, which can then be developed, deployed, and scaled individually. The Strangler Fig pattern helps in gradual migration by gradually diverting workloads from the legacy systems to the microservices in order to allow organizations to test each microservice in the production environment before doing the next migration [3].

Cloud native architecture is an extension of microservices that harnesses the full power of cloud computing. Cloud native apps fully take advantage of the benefits of the cloud and make use of the benefits of containerized application technologies that include bundling the application and the dependencies together with the aim of achieving the same environment from development to run time. Container orchestration tools take care of the deployment, scale management, and management of the containerized apps that run on top of machine clusters that can be physical or virtual. Kubernetes is a container orchestration solution that has been equipped with functionalities that include rolling out and rolling back apps automatically. It, in turn, provides self-healing abilities that can revive a failed container and redirect the workload to another node if the node is unresponsive [4].

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Communication patterns in microservices use both synchronous and asynchronous methods based on coupling and consistency requirements. Synchronous communication using REST API or gRPC is useful for querying and commands that require an immediate response. In addition, this method of communication introduces temporal coupling because when the components are unavailable, it leads to cascading failures in the system. Asynchronous methods of communication using message queues ensure that there is no temporal coupling since services run independently, and this allows for differing speeds of execution. Patterns for event-driven programming allow services to handle domain events in the system without necessarily knowing the source of the events [3].

Resilience design patterns are used to make the microservices architecture fault-tolerant and prevent cascade failures and performance degradation. The use of circuit breakers is used to identify failed services and thus prevents repeated calls to such failed services, thus further degrading the stability state of the whole system. The Circuit Breaker design pattern keeps track of failed calls as well as successful calls, and once a threshold number of failed calls is reached, it opens a circuit to make a cascade failure [Kamal, 2020]. The bulkhead design patterns segregate resources used by different operations to prevent resource degradation in a particular domain because resource degradation in a domain does not affect other domains. Kubernetes can autoscale pods horizontally, based on metrics such as observed CPU utilization, as well as vertically, by adjusting the amount of CPU and Memory [4].

Architecture Type	Deployment Model	Scalability Approach	Communication Pattern	Failure Handling
Legacy Monolith	Single Unit	Vertical Scaling	Tight Coupling	Cascading Failures
Microservices	Independent Services	Horizontal Scaling	REST/gRPC	Circuit Breakers
Cloud-Native	Container Orchestration	Auto-Scaling	Asynchronous Messaging	Self-Healing
Event-Driven	Distributed Components	Elastic Infrastructure	Event Streams	Bulkhead Isolation

Table 1: Architectural Transformation Characteristics in Insurance Systems [3][4]

3. DOMAIN-DRIVEN DESIGN AND MODULAR ARCHITECTURE IN INSURANCE APPLICATIONS

Domain-Driven Design sets forth strategic and technical patterns for dealing with complexity in software systems using domain knowledge. Strategic designs focus on knowing the domain and developing a ubiquitous language, along with detecting bounded contexts that denote distinct semantic domains in the domain of interest. Bounded contexts denote domains that explicitly denote conceptual domain models within which are different and may use different models for identical conceptual domains [5].

For example, in various insurance domains, contexts are majorly dominated by core capabilities in domains such as policy management, processing of claims, underwriting activities, and billing systems [5]. A ubiquitous language provides a common vocabulary between domain experts and development teams to ensure that terms in code map to business terms consistently. The language is created from collaborative modeling sessions where development teams and business experts work together to analyze business scenarios related to the domain and come up with key business rules. A ubiquitous language requires more than just naming and focuses on the semantics related to concepts, their lifecycles, invariants, and operations. A bounded context of policy administration would use terms such as “effective date,” “endorsement,” and “cancellation” in specific and common meanings associated across all conversations related to businesses [5].

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Context mapping describes relationships between the contexts, explaining integration patterns, as well as translation needs. Partnership relationships express dependence between contexts created by partnering groups with common goals for success. Customer-supplier relationships address dependence from upstream to downstream, with capabilities delivered from an upstream context and used by downstream contexts. Anti-Corruption Layers provide translations between model-incompatible contexts, maintaining the independence of downstream contexts from model modifications in the upstream context, as well as legacy system constraints. The published language describes common data models required by multiple contexts during communications, expressed in the form of schemas in registry repositories or application programming interfaces [5].

Tactical design patterns offer structures that can be used as building blocks in implementing domain models. Entities model things with a distinct identity that survive transformations of state as well as system resets. They represent descriptive data, termed as value objects, such as address, monetary value, coverage terms, focusing instead on immutability, making them eligible to be shared or replaced without having issues of identity. An aggregate establishes boundaries of consistency by identifying entities and value objects needing consistency with respect to business invariants. The aggregate then provides a sole entry point of external access [6].

In relation to this, a policy aggregate may contain coverage entities as well as premium value objects, with the policy being obligated by the sum of coverage premiums [6]. Domain services package business logic that has nothing to do with a particular entity or value object. Domain events represent meaningful events in the domain. They make it possible to loosely couple domain changes with the desired actions. Event-sourced data structures store the state as a series of events rather than as a snapshot of the state. This makes it possible to perform temporal queries. Repositories are abstracted persistence techniques. They offer collection-style APIs for accessing and storing aggregate roots while obscuring database concerns in query languages, connection creation, and transactions [6].

DDD Component	Purpose	Insurance Example	Boundary Type	Persistence Pattern
Bounded Context	Semantic Boundary	Policy Administration	Explicit Domain Model	Context-Specific
Entity	Unique Identity	Policy Object	Aggregate Root	Identity-Based
Value Object	Descriptive Data	Premium Amount	Immutable Type	Replaceable
Aggregate	Consistency Boundary	Policy with Coverages	Transactional Unit	Event-Sourced
Domain Event	Business Occurrence	PolicyIssued Event	Asynchronous Trigger	Event Stream
Repository	Data Abstraction	PolicyRepository	Collection Interface	Storage-Independent

Table 2: Domain-Driven Design Components in Insurance Applications [5][6]

4. API DESIGN, INTEGRATION PATTERNS, AND EVENT-DRIVEN ARCHITECTURE

Application Programming Interface design establishes the contract through which systems interact, requiring careful consideration of usability, stability, and extensibility. RESTful API design principles organize resources around business entities, exposing them through uniform interfaces using standard HTTP methods. Resource-oriented architectures use HTTP verbs to manipulate resources, with GET retrieving resource representations, POST creating new resources, PUT updating existing resources with complete replacements, and DELETE removing resources [7]. Resource URIs follow hierarchical structures reflecting domain relationships, and proper

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HTTP status codes communicate operation results with specific ranges indicating success, client errors, or server failures [7].

API versioning strategies maintain backward compatibility while enabling evolution. URI-based versioning embeds version identifiers in paths, providing clear version boundaries, while header-based versioning uses custom headers or content negotiation, maintaining clean URIs but requiring clients to specify versions explicitly. Regardless of strategy, semantic versioning principles guide version numbering with major versions indicating breaking changes, minor versions adding backward-compatible functionality, and patch versions addressing defects. Request and response design balances expressiveness with simplicity, with JSON emerging as the predominant serialization format due to widespread tooling support and human readability [7].

Event-driven architecture models system behavior as sequences of events representing significant domain occurrences. Event sourcing ensures that all changes to application state are stored as a sequence of events, allowing the system to reconstruct past states and providing a complete audit log of all changes. This pattern proves particularly valuable when regulatory requirements mandate comprehensive audit trails, when debugging complex scenarios requires understanding exactly how the system reached its current state, or when business analytics teams need to query historical data [8]. Domain events communicate business state changes, including policy issuance, claim approval, and payment receipt, containing sufficient context for consumers to process them independently without synchronous queries back to producers [8].

Command Query Responsibility Segregation separates read and write models, optimizing each for its specific access patterns. Command models enforce business rules and maintain consistency boundaries through aggregates, while query models provide denormalized views optimized for specific read scenarios without the constraints of normalized data models. This separation enables independent scaling, with read-heavy workloads scaling horizontally across multiple query model instances while write operations concentrate on command model instances. Event-driven synchronization propagates changes from command to query models through domain events, accepting eventual consistency in exchange for scalability and performance benefits [8].

API gateway patterns consolidate cross-cutting concerns, including authentication, rate limiting, request routing, and protocol translation. Gateways serve as the single entry point for all external requests, simplifying client configuration and enabling centralized policy enforcement. Authentication and authorization mechanisms verify caller identity and permissions before routing requests to backend services. Rate limiting prevents abuse and protects backend systems from overload, while request and response transformation adapts between external contracts and internal service interfaces [7].

Integration Pattern	Communication Style	Consistency Model	Versioning Strategy	Use Case
RESTful API	Synchronous	Strong Consistency	URI-Based Versioning	Policy Queries
Event Sourcing	Asynchronous	Eventual Consistency	Schema Evolution	Audit Trails
CQRS	Separated Read/Write	Eventual Consistency	Model Versioning	Claims Processing
API Gateway	Unified Entry Point	Request-Response	Header Versioning	External Integration
Message Queue	Decoupled Services	Eventual Consistency	Message Versioning	Notification Systems

Table 3: API Integration Patterns and Event Architecture [7][8]

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5. SECURITY, COMPLIANCE, AND DATA PROTECTION IN INSURANCE PLATFORMS

Security architecture in insurance platforms requires defense-in-depth approaches, layering multiple protective mechanisms to mitigate diverse threat vectors. The OWASP Top Ten identifies the most critical security risks to web applications, including injection attacks, broken authentication, sensitive data exposure, XML external entities, broken access control, security misconfiguration, cross-site scripting, insecure deserialization, using components with known vulnerabilities, and insufficient logging and monitoring [9]. Perimeter security establishes the first line of defense through firewalls, intrusion detection systems, and distributed denial-of-service protection. Web application firewalls inspect HTTP traffic for common attack patterns, including SQL injection attempts, cross-site scripting exploits, and command injection vulnerabilities [9].

Identity and access management form the foundation of security controls, ensuring that only authenticated and authorized entities access protected resources. Multi-factor authentication combines multiple credential types, including knowledge factors such as passwords, possession factors such as hardware tokens, and inherence factors such as biometric characteristics to strengthen authentication assurance. OAuth 2.0 and OpenID Connect provide standardized protocols for delegated authorization and federated authentication, enabling secure integration with external identity providers. JSON Web Tokens encapsulate user identity and claims in cryptographically signed formats, enabling stateless authentication suitable for distributed microservices architectures [9].

Authorization mechanisms control access to resources based on user identity, roles, and contextual attributes. Role-Based Access Control assigns permissions to roles rather than individual users, simplifying administration as user responsibilities change. Attribute-Based Access Control evaluates access decisions using attributes of users, resources, actions, and environmental context, providing fine-grained control for complex scenarios. The principle of least privilege grants users the minimum permissions necessary for their functions, limiting potential damage from compromised accounts or insider threats. Security misconfiguration represents one of the most common vulnerabilities, occurring when security settings are not defined, implemented, or maintained properly [9].

Data protection mechanisms safeguard sensitive information throughout its lifecycle from collection through disposal. The NIST Cybersecurity Framework provides a policy framework of computer security guidance for how organizations can assess and improve their ability to prevent, detect, and respond to cyber attacks. The Framework Core consists of five concurrent and continuous Functions: Identify, Protect, Detect, Respond, and Recover, which provide a strategic view of the lifecycle of an organization's management of cybersecurity risk [10]. Encryption at rest protects stored data using industry-standard algorithms with key management systems controlling access to encryption keys [10].

Audit logging captures security-relevant events for compliance monitoring, incident investigation, and forensic analysis. Comprehensive logs record authentication attempts, authorization decisions, data access, configuration changes, and security control modifications. Insufficient logging and monitoring represent a critical vulnerability because without proper logging and monitoring, breaches cannot be detected, and attackers can persist in systems, extracting, modifying, or destroying data [9]. The NIST Framework emphasizes the Detect function, which develops and implements appropriate activities to identify the occurrence of a cybersecurity event through continuous monitoring and detection processes [10].

Security Layer	Control Mechanism	Authentication Method	Protection Scope	Compliance Function
Perimeter Defense	Firewall/IDS	Network-Level	Infrastructure	Identify Threats
Identity Management	Multi-Factor Auth	OAuth 2.0/JWT	User Access	Protect Resources
Authorization	RBAC/ABAC	Role-Based Control	Resource Access	Detect Violations
Data	Encryption at	Key Management	Sensitive Data	Respond to Incidents

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Protection	Rest			
Audit Logging	Event Recording	Centralized Logs	System Activities	Recover Operations

Table 4: Security and Compliance Framework Components [9][10]

6. AWS CLOUD INFRASTRUCTURE FOR SCALABLE INSURANCE SOLUTIONS

Amazon Web Services provides comprehensive cloud computing capabilities spanning compute, storage, networking, databases, and specialized services essential for modern insurance applications. The AWS Well-Architected Framework describes key concepts, design principles, and architectural best practices for designing and running workloads in the cloud. The framework is built on six pillars: Operational Excellence, Security, Reliability, Performance Efficiency, Cost Optimization, and Sustainability [11]. Each pillar includes design principles that guide architectural decisions and best practices that provide specific guidance for implementing the principles [11].

Compute services support diverse workload patterns from traditional server-based applications to serverless event-driven functions. Elastic Compute Cloud provides resizable virtual machines with various instance types optimized for compute-intensive, memory-intensive, or storage-intensive workloads. Auto Scaling automatically adjusts compute capacity based on demand patterns, maintaining performance during peak loads while reducing costs during quiet periods. The Reliability pillar focuses on workloads performing their intended functions and how to recover quickly from failure to meet demands, including distributed system design, recovery planning, and adaptation to changing requirements [11].

Container orchestration through Elastic Container Service or Elastic Kubernetes Service streamlines the deployment and management of microservices architectures. Containers package applications with their dependencies, ensuring consistent execution environments across development, testing, and production environments. Container orchestration platforms automate deployment, scaling, load balancing, and self-healing of containerized applications. Service discovery mechanisms enable dynamic service location as instances start and stop, while rolling updates deploy new application versions gradually, maintaining availability throughout deployment cycles [11].

Storage services accommodate diverse data types and access patterns. Simple Storage Service provides object storage for unstructured data, including policy documents, claims photos, and application logs, with durability across multiple facilities. Storage classes with different performance and cost characteristics enable optimization based on access patterns, with infrequent access and archival tiers significantly reducing costs for rarely accessed data. The Cost Optimization pillar focuses on avoiding unnecessary costs by understanding spending over time and controlling fund allocation, selecting appropriate resource types and quantities, and scaling to meet business needs without overspending [11].

Database services span relational, NoSQL, in-memory, and graph databases, enabling workload-appropriate selections. Relational Database Service provides managed PostgreSQL, MySQL, Oracle, and SQL Server databases with automated backups, patching, and replication. DynamoDB offers single-digit millisecond latency and NoSQL database scaling to accommodate millions of requests per second. The Performance Efficiency pillar focuses on structured and streamlined allocation of IT and computing resources, including selecting resource types and sizes optimized for workload requirements, monitoring performance, and making informed decisions to maintain efficiency as business needs evolve [11].

7. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING INTEGRATION

Artificial Intelligence can revolutionize the workings of the insurance sector by automating certain existing human tasks, enhancing human decision-making abilities, and allowing new modes of service delivery based upon the capabilities of AI to identify patterns and make predictions. Deep learning is seen to be a sub-area of machine learning that utilizes 'neural networks with many layers to learn higher-level representations from raw data.' Some

deep learning models include convolutional neural networks (for image processing), recurrent neural networks (for sequential data), and transformers (for natural language processing) [12]. The machine learning cycle includes problem definition, data selection and preparation, feature selection, training and evaluation, and monitoring [12].

Claims processing uses computer vision to evaluate accident damage based on pictures uploaded via smartphone apps. Convolutional neural networks are trained on pictures to classify damage patterns and assign costs for repairs based on hierarchical feature extraction. Natural language processing is used to derive structured information from unstructured claim descriptions, police statements, and medical histories. Named Entity Recognition isolates relevant entities such as individuals, geographic locations, and dates, while Relation Extraction reveals linking entities such as cause and effect relationships and injuries sustained during accidents [12].

Anomaly detection and supervised learning techniques are used for fraud detection. Machine learning techniques such as decision trees, forests, gradient boosting, and feedforward networks can be employed for modeling patterns related to fraud based on past instances. Hands-On Machine Learning presents a detailed range of topics related to the basics of machine learning, such as supervised learning methodologies, unsupervised learning methods, feedforward networks, and real-world implementations using popular toolsets [13]. Characteristics extracted from the claim, claimant, social network analysis, and external inputs are used for training a model to distinguish between genuine and fraudulent claims [13].

Underwriting automation employs predictive models for risk assessment and pricing recommendations. The gradient boosting models based on past policy and claim records predict loss costs for new business by aggregating various weak predictive models to produce robust predictive models. The models employ conventional rating variables, alternative data, and telematics data available in connected vehicles. The process for building a predictive model using a machine learning system generally includes data exploration to gain insights into data distributions and associations, followed by model development and hyperparameter tuning, and ending with testing on a hold-out test dataset [13].

The customer service chatbots deal with the routine queries, and the complex queries are attended to by the agents. Natural language understanding entails the interpretation of customer queries by mapping queries to the corresponding intent by the text-classification algorithms. Dialog management refers to the ability of the chatbots to maintain the conversation flow and assist the user in the end-to-end conversational interactions. Backend integrations provide the necessary functionalities of fetching policy details, processing claims, and processing payments. The chatbots learn from the conversations solved and become accurate by model re-training on the production data to ensure continuous improvements to accuracy, as stated by [13].

8. DEVOPS, OBSERVABILITY, AND CONTINUOUS DELIVERY PRACTICES

The cultural norms and technical systems of DevOps allow for rapid and trustworthy delivery of software by integrating the efforts of the development and operations staff. Continuous Delivery is the concept of the software development life-cycle, in which the software is developed in such a way that it can easily be deployed to the production environment at any point in time. The deployment pipeline offers automation of the application's build, deployment, testing, and release process, where every change in the code triggers the execution of the pipeline [14]. Infrastructure as Code describes infrastructure in terms of versioned configuration files that allow for reproducibility of infrastructure changes [14].

Code integration in Continuous Integration strategies happens often, with code validation after each integration through builds and tests. Version control tools allow tracing of code changes with a complete history of modifications in code, which helps in parallel development of code by different teams working together. Automation builds processes, compiles code, runs unit tests, does code analysis, and produces deployable packages. CD pipeline involves a commit stage in which code compilation and unit testing are carried out, automated acceptance testing, and capacity testing for assessing performance under loads [14].

Continuous Delivery is an extension of Continuous Integration, encompassing the automation of deployment over various environments. Deployment pipelines provide control over the movement of code from the development stage to test, staging, and production environments, with various tests being performed at each level to ensure functionality, performance, security, and compliance. In blue-green deployment, two copies of the production environment are created, with rotation of users during deployment, facilitating immediate switching in case of problems. In canary deployment, incremental user traffic routing can be performed based on health checks before rolling out the application entirely [14].

The DevOps Handbook outlines the Three Ways that must be considered to fully understand the principles of DevOps. The First Way is a focus on system thinking and fast flow from the development environment to the operation environment and ultimately to the customers. The Second Way is an "emphasis on amplifying the feedback loops," meaning that the goals of the organization should be focused on preventing problems from recurring. The Third Way is the "culture of CIE and L," which stands for the culture of continual experimentation and learning. "The First Way provides the 'how' of improved IT in the contemporary digitized organization."

Service level goals are quantified by measuring service level indicators related to specified system properties. Availability is a measure of systems' performance in responding successfully to requests by a certain percentage of time, delay metrics gauge the time taken by systems in responding, usually in percentile values, and error rates are a measure of requests that produce errors. Error budgets are set in such a way that a balance between innovation speed and need for reliability is achieved, based on values that determine acceptable unreliability in terms of downtime or error values [15]. Incident management processes include roles, communication, and escalation procedures for disruptions in services, and root causes for prevention in postmortem analysis of disruptions [15].

CONCLUSION

Modernization in insurance systems also demands end-to-end transformation in architectural patterns, development methodologies, platform infrastructures, and intelligent automation technologies. Domain-driven design methodologies help in strictly demarcating business capabilities, retaining semantics in systems in a common language, and bounded context representation. Microservices architecture helps in carving structurally autonomous applications in BDSD, allowing different teams for individual developments and strategic scaling according to concrete component requirements. Cloud Native platform on Amazon Web Services ensures dynamic scaling facilities for computing, databases, storage, and specific services for insurance. Security systems, implementing Defense-In-Depth, ensure secure mitigation against important and sensitive data involving direct users in multi-layered access, authorization, encryption, and overall auditing trails fully satisfying regulation standards. Event-Stimulated Systems make opportunistic decoupling in different applications in message transmission and domain events, encouraging real-time systems representation. Integration in Artificial Intelligence associates complete automation in claim settlement, detection of fraud, optimization in underwriting, and CB in different customer interactions. DevOps methodologies involving complete integration of continuous development, outputs, infrastructures, and observability assure accelerated deployment, retaining overall system reliability. Organizations embracing these technologies advance in effectively catering to innovation in insurance offerings, overall clinch in superior customer service, alongside operational benefits in competitive digital platforms.

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