

Regulatory Technology and Automated Compliance Reporting in Saudi Arabia's Insurance Sector: A Vision 2030 Framework

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Abstract: *Saudi Arabia's insurance sector is moving toward a more digitally integrated supervisory environment in which regulatory obligations, operational data and reporting processes can increasingly be connected through technology. Regulatory technology, or RegTech, provides a practical mechanism for translating this direction into insurer-level compliance capability. This paper examines how RegTech and automated compliance reporting can improve the accuracy, timeliness, traceability and efficiency of regulatory compliance in Saudi insurance under Vision 2030. The study adopts an integrative review and conceptual-synthesis approach, combining recent peer-reviewed literature on RegTech, SupTech, automated reporting, machine-readable regulation, artificial intelligence and compliance-by-design with official Saudi insurance-sector policy and digital-supervision developments. The analysis identifies six essential capabilities: a structured regulatory obligation register; standardized and governed data; machine-readable compliance rules; automated validation and workflow; evidence-based audit trails; and accountable human oversight. Saudi developments provide a strong institutional basis for this model. The Insurance Authority's National Insurance Sector Strategy includes dedicated programs for Regulations & Legislation and Technology, Data & Artificial Intelligence, while the TAMEEN portal has expanded digital licensing, approval, supervisory and regulatory services. The paper proposes a Saudi Insurance RegTech and Automated Compliance Reporting Framework linking regulatory sources, compliance rules, enterprise data, validation engines, exception management, reporting and governance. The framework emphasizes that automation should not be treated as the removal of compliance professionals. Instead, technology should reduce repetitive reconciliation and reporting work while improving the capacity of specialists to interpret regulatory changes, investigate exceptions and provide accountable sign-off. Key risks include poor data lineage, rule misinterpretation, algorithmic opacity, cybersecurity exposure, third-party dependency and over-automation. The paper concludes that a controlled compliance-by-design approach can strengthen supervisory responsiveness, lower avoidable*

compliance cost and support a more resilient and digitally mature Saudi insurance market.

Keywords: *RegTech; regulatory technology; insurance compliance; Saudi Arabia; Vision 2030; automated regulatory reporting; TAMEEN; SupTech; machine-readable regulation; compliance-by-design.*

I. INTRODUCTION

Insurance is a highly regulated financial activity because insurers hold policyholder funds, price uncertain future liabilities, manage sensitive personal information and must remain able to pay claims under adverse conditions. Compliance therefore extends across licensing, governance, solvency, actuarial reporting, product approval, market conduct, consumer protection, reinsurance, investment, cybersecurity, anti-financial-crime obligations and operational resilience. In a traditional compliance model, these obligations are frequently translated into manual checklists, spreadsheets, email approvals and periodic reporting exercises. Such arrangements can work at small scale, but they become difficult to sustain as products, data volumes, regulatory requirements and supervisory expectations increase.

Regulatory technology, commonly described as RegTech, refers to the use of digital technologies to support the interpretation, execution, monitoring and evidence of regulatory compliance. The concept is broader than reporting software. A mature RegTech environment can identify applicable obligations, map them to policies and controls, extract relevant data, test compliance rules, flag exceptions, route issues to responsible owners and produce traceable evidence for management or regulators. Grassi and Lanfranchi (2022) emphasize the close relationship between data, technology and regulation, while Chao et al. (2022)

show how artificial intelligence and data-driven methods can increase the efficiency of financial supervision. The empirical evidence of Charoenwong et al. (2024) further indicates that compliance-driven technology investment can alter both internal operations and wider market structure.

Automated compliance reporting is one of the most practical RegTech applications. Regulatory returns often depend on data collected from finance, underwriting, claims, actuarial, reinsurance, investment and customer systems. When teams manually extract and reconcile these data for each reporting cycle, the process can be slow, difficult to reproduce and vulnerable to inconsistent definitions. Automation can create a controlled pipeline in which data are extracted from authoritative systems, standardized, validated against business rules, reconciled to source records, reviewed through an exception workflow and then submitted in a consistent format. The value is therefore not simply faster reporting; it is more transparent reporting with stronger data lineage.

Saudi Arabia provides an important context for this transformation. The Insurance Authority's National Insurance Sector Strategy places Regulations & Legislation and Technology, Data & Artificial Intelligence among the sector's strategic and enabling programs (Insurance Authority, 2026a). The strategy calls for modernized and unified digital infrastructure, improved data quality, secure data sharing, centralized insurance data and greater use of advanced analytics. It also refers to new supervisory tools and sustainable governance models. These priorities create a direct connection between Vision 2030, digital insurance development and the modernization of compliance.

The Insurance Authority has also implemented concrete digital-supervision initiatives. In February 2025, it launched the TAMEEN digital services portal with 36 licensing, approval, supervisory and regulatory services (Insurance Authority, 2025a). In December 2025, the Authority announced 15 additional services, bringing the publicized total to 51 and expanding electronic processes related to company registration, product registration, senior leadership positions, bancassurance, foreign reinsurance registration and electronic integration

(Insurance Authority, 2025b). The same announcement referenced the Insurance Data Hub, Insurance Integration Platform and Digital Maturity Measurement Project. These initiatives indicate a shift from fragmented interaction toward a more integrated digital relationship between regulated entities and the supervisor.

This shift creates a research and managerial question: how should Saudi insurers design internal compliance systems so that their data, controls and reporting processes can interact effectively with an increasingly digital regulatory environment? The answer cannot be limited to buying software. RegTech requires regulatory interpretation, structured data, clear ownership, controlled automation and assurance. Poorly governed automation can transmit errors faster than manual reporting, while opaque artificial-intelligence tools can make accountability more difficult. The purpose of this paper is therefore to develop a governance-oriented framework for regulatory technology and automated compliance reporting in Saudi insurance.

The paper contributes by connecting international RegTech research to current Saudi insurance-sector developments. It distinguishes automation from accountability, explains the architecture of a controlled reporting pipeline, identifies implementation risks, and proposes measurable outcomes for insurers and regulators. The study remains conceptual: it does not claim causal improvements without firm-level evidence. Instead, it develops a testable framework for future empirical research and practical implementation.

II. AIM, OBJECTIVES AND RESEARCH QUESTIONS

The aim of this study is to develop an evidence-based Vision 2030 framework for Regulatory Technology and automated compliance reporting in Saudi Arabia's insurance sector.

Five objectives guide the paper. First, it identifies the core RegTech capabilities relevant to insurance compliance and regulatory reporting. Second, it examines how standardized data, machine-readable rules, automation and analytics can improve reporting

accuracy, timeliness and traceability. Third, it evaluates governance, cybersecurity, legal-interpretation and model risks created by compliance automation. Fourth, it connects insurer-level RegTech design to the Insurance Authority's digital transformation and supervisory initiatives. Fifth, it proposes a phased implementation model and balanced scorecard for insurers seeking to modernize compliance without weakening accountable human oversight.

Four research questions follow. RQ1: Which RegTech capabilities are most important for Saudi insurance companies? RQ2: How can automated compliance reporting improve regulatory data quality, efficiency and auditability? RQ3: Which risks can cause automated compliance systems to produce misleading or non-compliant outcomes? RQ4: How should Saudi insurers integrate technology, governance and human accountability to support Vision 2030 and an increasingly digital supervisory environment?

III. REVIEW METHODOLOGY

This study uses an integrative review and conceptual-synthesis methodology. The subject crosses financial regulation, insurance governance, information systems, artificial intelligence, data management and digital government. A narrowly quantitative review would therefore be insufficient for developing an operational framework.

The academic search emphasized peer-reviewed literature published mainly from 2020 onward using combinations of the terms RegTech, regulatory technology, SupTech, financial compliance, regulatory reporting, machine-readable regulation, automated compliance, artificial intelligence, data governance and compliance-by-design. Particular attention was given to Journal of Financial Economics, International Review of Financial Analysis, Journal of Financial Regulation and Compliance, Journal of Banking Regulation, Journal of Financial Reporting and Accounting, Journal of Financial Crime and related technology-governance research. Foundational work on compliance-by-design was included where it explains principles still relevant to modern architectures.

Official Saudi sources were used independently to establish institutional and current market context. These include the Insurance Authority's National Insurance Sector Strategy, TAMEEN portal announcements, information on digital services, the 2024 market report, and official statements concerning sector-wide data, artificial intelligence and digital maturity initiatives. An earlier Saudi Central Bank source on InsurTech rules was also considered as historical context because insurance supervision was previously located within SAMA.

The synthesis organized evidence into six capability domains: regulatory knowledge management, data governance, machine-readable rules, automated validation, workflow and exception management, and governance assurance. These domains were then linked to four outcomes: reporting accuracy, reporting timeliness, auditability and regulatory responsiveness. The paper does not fabricate survey responses, case-study results or article-screening counts. It does not assume that every Saudi regulatory return is currently machine-readable or accessible through application-programming interfaces. Where the framework describes real-time integration, automated rule execution or structured regulatory taxonomies, these are presented as design recommendations rather than claims about existing mandatory infrastructure. Future studies should validate the framework with insurer-level process data, error rates, reporting-cycle times, audit findings and supervisory feedback.

IV. SAUDI REGULATORY TECHNOLOGY AND VISION 2030 CONTEXT

The National Insurance Sector Strategy provides the strongest policy foundation for RegTech in Saudi insurance. Its strategic structure explicitly includes Regulations & Legislation and Technology, Data & Artificial Intelligence. The technology program is intended to modernize and unify digital infrastructure, accelerate innovation, improve data quality, enable advanced analytics, facilitate secure data sharing and establish centralized and secure insurance data capabilities. These priorities are directly relevant to automated compliance because regulatory reporting quality depends on consistent data definitions, trusted source systems and secure exchange mechanisms.

The strategy also refers to improving regulatory frameworks and applying new supervisory tools. This is important because RegTech at the insurer and SupTech at the regulator are complementary. RegTech organizes a firm's obligations, evidence and reporting; SupTech enables the authority to ingest, analyze and monitor regulatory information more effectively. Zeranski and Sancak (2021) argue that supervisory technology can improve informational efficiency, while McCarthy (2023) emphasizes that RegTech and SupTech require coherent standards and regulatory clarity.

TAMEEN represents a visible step toward this digital-supervision model. At launch in February 2025, the portal contained 36 digital services covering licensing, approvals, supervisory and regulatory activities. The Insurance Authority described the initiative as a way to strengthen compliance efficiency and create an integrated digital insurance environment. Fifteen additional services were announced in December 2025, expanding the portal into areas such as company registration, product registration, senior management approvals and electronic integration. The expansion is shown in Figure 1.

The December 2025 announcement also referenced three related initiatives: the Insurance Data Hub, the Insurance Integration Platform and the Digital Maturity Measurement Project. Together, these initiatives suggest an architecture in which reporting and supervision can become more data-driven and less dependent on disconnected submissions. The Authority's 2026 cooperation with HUMAIN to

support insurance-sector artificial intelligence further demonstrates that data quality, secure sharing, advanced analytics and digital governance are current strategic priorities (Insurance Authority, 2026b).

RegTech can help insurers align with this environment by improving the internal quality of data supplied to regulators. If an insurer can trace each reported value back to an authoritative source, document transformations, reconcile totals automatically and preserve approval evidence, supervisory interaction becomes more reliable. Conversely, digital portals alone cannot solve poor internal data governance. The effectiveness of sector-wide digital supervision ultimately depends on the quality of the regulated entities' own control environments.

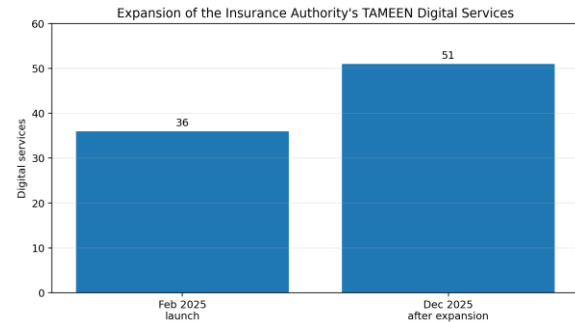


Figure 1. Expansion of TAMEEN digital services during 2025.

Source: Insurance Authority (2025a; 2025b). The initial 36 services were expanded by 15 additional services.

Table 1. Saudi digital-supervision developments relevant to RegTech

Development	Date	RegTech relevance	Compliance implication
TAMEEN portal launch	Feb 2025	36 licensing, approval, supervisory and regulatory services	Creates a more integrated digital interface between firms and supervisor
TAMEEN expansion	Dec 2025	15 additional digital services	Extends electronic regulatory workflows and integration
Insurance Data Hub / Integration Platform	Announced 2025	Sector data and connectivity initiatives	Raises importance of common data definitions, lineage and secure sharing

Development	Date	RegTech relevance	Compliance implication
Digital Maturity Measurement Project	Announced 2025	Sector-wide digital capability assessment	Encourages structured evaluation of insurer digital readiness
Insurance Authority–HUMAIN cooperation	Aug 2026	AI, secure data access and advanced analytics	Supports future AI-enabled regulatory and operational use cases

V. REGULATORY KNOWLEDGE AND MACHINE-READABLE RULES

The first pillar of RegTech is regulatory knowledge management. Insurance obligations originate from laws, regulations, circulars, licensing conditions, product requirements, reporting templates and supervisory communications. In many organizations, these materials are stored in separate folders or tracked through manual legal updates. That approach makes it difficult to determine which business process is affected by a regulatory change and whether the related control has been updated.

A structured obligation register converts regulatory text into manageable units. Each obligation should have a source, effective date, responsible owner, impacted entity, applicable business line, reporting frequency, control mapping and evidence requirement. The register should preserve the original legal text while also containing an operational interpretation approved by appropriate legal or compliance personnel. This distinction is critical because software should not silently replace legal judgment.

Machine-readable regulation extends this concept by expressing regulatory requirements in structured formats that systems can interpret. Buckley et al. (2020) describe how digital identification, reporting standards and data-protection requirements can create the infrastructure for RegTech. Research on machine-readable regulation similarly highlights the possibility of converting selected rules into executable logic. In insurance, a straightforward example might be a validation that a mandatory field is completed before a regulatory submission. A more complex obligation involving materiality, judgment or legal interpretation may remain unsuitable for full automation.

The practical design should therefore classify obligations according to automation suitability. Deterministic rules can be coded directly. Rules involving thresholds can be automated with parameter controls. Judgment-based requirements should trigger human review. Principle-based requirements may be monitored through evidence checklists or risk indicators rather than executed automatically. Such classification prevents the common mistake of treating every regulation as if it were a simple computer rule.

Change management is equally important. A regulatory amendment should trigger an impact assessment across policies, systems, data fields, reports, training and controls. Version control must preserve the previous rule, the new rule, approval history, implementation date and affected reports. This creates a defensible chain from regulatory change to operational response.

VI. DATA GOVERNANCE, LINEAGE AND REGULATORY DATA QUALITY

Automated compliance reporting depends on data governance more than on reporting software. A regulatory return is only as reliable as the data feeding it. Insurance companies often maintain separate systems for policies, claims, finance, investments, reinsurance, customer management and actuarial analysis. The same concept may have different names or definitions across these systems, creating reconciliation risk.

A RegTech architecture should begin with a regulatory data dictionary. Each reported item should have a defined meaning, source system, data owner, calculation logic, permitted transformations, reporting frequency and quality rule. Data lineage should show how the value moves from source transaction through transformation and aggregation into the regulatory

return. This creates traceability for internal audit, external audit and supervisory review.

Data quality controls should test completeness, validity, accuracy, timeliness, uniqueness and consistency. A missing policy type, impossible date, negative amount in an inappropriate field or unexplained difference between finance and actuarial totals should be identified before submission. Controls should distinguish warnings from hard failures so that immaterial issues do not stop the entire reporting cycle.

Reconciliation is particularly important. Automated reporting should not merely extract figures; it should reconcile them to authoritative totals. Premium information may need to agree with finance records, claims totals with claims ledgers, investment data with custodial or accounting records, and solvency information with approved actuarial calculations. A reconciliation engine can apply tolerances, document accepted differences and escalate unexplained mismatches.

The architecture must also preserve provenance. Each regulatory value should carry metadata showing when it was extracted, from which system, under which rule version and by which transformation. This supports reproducibility: if the same report is regenerated from the same approved data and rules, the result should be explainable. Such provenance is essential in automated environments because visual inspection of spreadsheets is no longer sufficient.

Data protection and cybersecurity must be embedded from the start. Insurance data can contain medical, financial and identity information. RegTech systems should implement role-based access, encryption, logging, segregation of duties, retention rules and secure interfaces. Compliance automation that increases the movement of sensitive data without improving access control can increase rather than reduce regulatory risk.

The Insurance Authority's strategy for sector-wide data and secure sharing strengthens the relevance of these capabilities. Insurers with mature internal dictionaries, lineage and validation will be better prepared for more integrated digital reporting and

supervisory analytics.

VII. AUTOMATED COMPLIANCE REPORTING WORKFLOW

The automated reporting workflow begins when approved data are extracted from source systems according to a controlled schedule or event trigger. Extraction should use documented interfaces rather than ad hoc manual downloads wherever feasible. The data are then standardized into a common regulatory taxonomy so that business definitions remain consistent across reports.

The next stage is automated validation. Rules may include field-level checks, cross-field relationships, threshold tests, historical variance analysis, reconciliation to general-ledger or actuarial totals, and comparisons across regulatory returns. Validation should be transparent: users should know which rule failed, which data triggered the failure and what action is required. Black-box validation undermines accountability.

Exceptions then enter a workflow. Each issue should have severity, owner, due date, evidence and resolution status. A compliance system can route a claims-data issue to claims operations, a finance reconciliation to finance, and an actuarial inconsistency to the appointed actuarial function. This converts reporting from a last-minute compilation exercise into a managed control process.

Material exceptions should require documented resolution or approved override. Overrides must not simply remove an error flag. They should record the reason, approver, supporting evidence and whether the issue represents a one-time data problem or a structural weakness requiring remediation. Repeated overrides are a useful risk indicator and should be reported to management.

After validation and exception closure, the report enters an approval stage. Accountable executives or regulatory-report owners should review key metrics, significant movements, unresolved limitations and certification requirements. Digital signatures or workflow approvals can provide evidence that reporting accountability has been exercised.

Automation should make the sign-off more informed, not ceremonial.

Submission can then occur through the relevant digital channel. Where technical interfaces permit, structured files or system integration may reduce manual re-entry. Where a portal still requires human upload, the same controlled package can be used. The final stage is archival: the submitted file, rule version, source snapshot, validation results, approvals and correspondence should be retained as one evidence package.

This end-to-end design is illustrated in Figure 3. It operationalizes compliance-by-design by placing controls inside the reporting process rather than relying solely on post-submission review. Julisch et al. (2011) showed the importance of bridging audit and system architecture, and more recent regulation-by-design literature similarly emphasizes embedding obligations into technical processes while preserving governance.

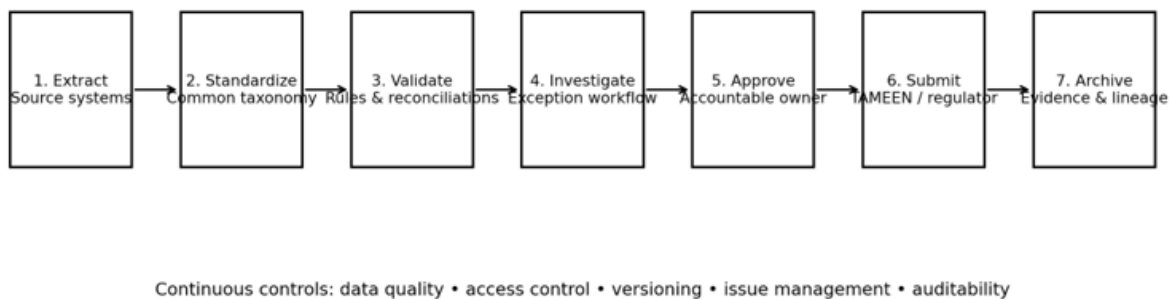


Figure 2. Automated regulatory reporting workflow with embedded controls.

Source: Author's synthesis.

Table 2. Illustrative automated controls in insurance regulatory reporting

Control type	Example	Automation level	Evidence retained	Escalation trigger
Completeness	Mandatory data fields populated	High	Validation log	Missing required value
Validity	Dates, codes and ranges follow approved formats	High	Rule result and source field	Invalid or impossible value
Reconciliation	Reported totals agree to authoritative ledger/actuarial totals	High	Reconciliation report	Difference above tolerance
Variance	Material movement versus prior period is explained	Medium	Variance analysis	Movement above threshold
Judgment	Material classification or legal interpretation	Low / human-led	Approval note and supporting evidence	Unclear or disputed interpretation
Submission	Approved return matches submitted file	High	Hash/version and submission receipt	Mismatch or failed submission

VIII. ARTIFICIAL INTELLIGENCE AND ADVANCED REGTECH

Artificial intelligence can extend RegTech beyond deterministic validation. Natural-language processing can classify regulatory documents, compare new and old circulars, identify potentially affected policies and propose obligation mappings. Machine-learning models can identify unusual reporting movements, prioritize exceptions and detect patterns associated with operational or conduct risk. Predictive SupTech research also demonstrates how supervisors can use analytical tools to identify deterioration earlier.

These applications should be selected carefully. Regulatory reporting contains many deterministic relationships that do not require artificial intelligence. A simple reconciliation rule is easier to validate, explain and audit than a machine-learning model and should be preferred when it solves the problem. AI adds value where classification, text interpretation or anomaly detection is genuinely difficult.

Explainability is especially important in compliance. If a model labels a transaction, product or report as high risk, users need to understand the principal drivers sufficiently to investigate. An unexplained score cannot replace professional judgment. García-Llorente and Olmeda (2026) emphasize accountability challenges in algorithmic governance, while broader RegTech research consistently identifies transparency and governance as prerequisites for responsible adoption.

Model risk management should therefore apply to material RegTech models. This includes documented purpose, training data, performance measures, limitations, approval, independent validation, monitoring, change control and retirement criteria. Models should be tested for drift because reporting patterns and regulations change. A model trained on historical exceptions may become less reliable when products, systems or rules are redesigned.

Generative AI creates additional opportunities and risks. It can summarize regulatory updates, draft impact assessments or help compliance staff query a structured obligation library. However, generative systems can hallucinate, omit qualifications or

produce confident but incorrect interpretations. They should therefore operate within controlled knowledge bases and require human verification before an output becomes an approved compliance position.

The safest principle is proportionality. Automation should increase as the rule becomes more deterministic, the data become more controlled and the consequences of error become more manageable. High-impact judgment should retain stronger human review. This allows insurers to gain efficiency without transferring legal accountability to an algorithm.

IX. GOVERNANCE, CYBERSECURITY AND OPERATIONAL RESILIENCE

Governance determines whether RegTech strengthens or weakens compliance. Clear ownership is required across compliance, legal, finance, actuarial, risk, technology, information security, internal audit and business functions. Compliance should own the interpretation framework, while data owners remain responsible for source quality and technology teams for system operation. No single function should be able to change a material reporting rule and deploy it without review.

Segregation of duties should cover rule configuration, data adjustment, exception approval and final submission. A user who prepares a regulatory return should not be able to approve every material exception without independent challenge. Access rights should follow least-privilege principles and be reviewed periodically.

Auditability must be designed into the platform. Logs should record rule changes, data extracts, manual adjustments, overrides, approvals and submissions. Internal audit should be able to reproduce the reporting pathway from submitted figure back to source. This is particularly important when automation reduces visible manual work, because assurance must shift from checking spreadsheets to assessing system controls, data lineage and rule governance.

Third-party dependency is another risk. Many insurers will use external cloud platforms, data providers or RegTech vendors. Contracts should address availability, data location, confidentiality, incident

notification, subcontracting, audit rights, exit planning and continuity. Vendor models should not become unchallengeable simply because their intellectual property is proprietary.

Cybersecurity is inseparable from RegTech because reporting systems may connect multiple sensitive databases and regulatory interfaces. A successful cyberattack could manipulate regulatory data, disrupt submission deadlines or expose policyholder information. Security testing, privileged-access management, backup, recovery and incident response should therefore be part of compliance-system governance.

Business continuity is also essential. Automated reporting can create concentration in a central platform. Insurers should maintain contingency procedures for system failure, including controlled manual or alternate-channel submissions where legally permitted. Continuity exercises should test whether data, approvals and evidence can be reconstructed.

Finally, management should distinguish automation risk from compliance risk. A control can fail because the legal interpretation is wrong, the source data are wrong, the coded rule is wrong, the workflow is bypassed or the technology is unavailable. Root-cause classification helps ensure that remediation addresses the correct layer rather than treating every problem as an IT incident.

X. PROPOSED SAUDI INSURANCE REGTECH AND AUTOMATED COMPLIANCE REPORTING FRAMEWORK

The proposed Saudi Insurance RegTech and Automated Compliance Reporting Framework contains six connected layers. The first is the regulatory source layer, containing laws, regulations, circulars, reporting instructions, product obligations and supervisory communications. The second is the compliance rules layer, where obligations are structured, classified and mapped to controls. These two layers establish what the organization must do and which requirements can be automated.

The third layer is the enterprise data layer.

Authoritative policy, claims, finance, actuarial, reinsurance and investment data are standardized through common definitions, ownership and lineage. Data quality controls operate before regulatory calculations are performed. This prevents the reporting engine from becoming a mechanism that merely automates poor-quality information.

The fourth layer is the RegTech engine. It executes deterministic validations, reconciliations, workflow routing, exception management and selected analytical models. Rules should be versioned and linked to the regulatory source that justifies them. Users should be able to see why an exception was created.

The fifth layer is reporting and evidence. Approved data are transformed into regulatory returns, management dashboards and evidence packages. Each output includes lineage, validation status, material exceptions and approval records. This layer interfaces with TAMEEN or other authorized regulatory channels as required.

The sixth layer is governance and assurance. Human approval, legal interpretation, model validation, cybersecurity, segregation of duties, internal audit and change management surround the technical process. Governance is shown as a foundational layer in Figure 2 because every automated component requires accountable ownership.

A phased implementation model is preferable to a large replacement program. Phase one should inventory obligations, reports, data sources and existing manual controls. Phase two should standardize regulatory data and automate high-volume deterministic checks. Phase three should implement workflow, evidence and centralized reporting. Phase four can introduce advanced analytics, natural-language processing and deeper system integration where controls are mature. Phase five should optimize the architecture using performance data and supervisory feedback.

The framework also requires a balanced scorecard. Accuracy measures can include reporting corrections, reconciliation breaks and validation failures. Efficiency measures include preparation time, manual

adjustments and cycle time. Governance measures include overdue exceptions, unapproved rule changes and override frequency. Supervisory responsiveness can be measured through response time to information requests and repeat findings. Cyber and operational resilience should track incidents, downtime and recovery performance.

objective is to create the highest level of reliable automation that preserves explainability, legal accuracy and accountable review. This distinction is important for Vision 2030: digital maturity should be measured by the quality and integration of decision processes, not by the number of manual tasks eliminated.

The objective is not to maximize automation. The

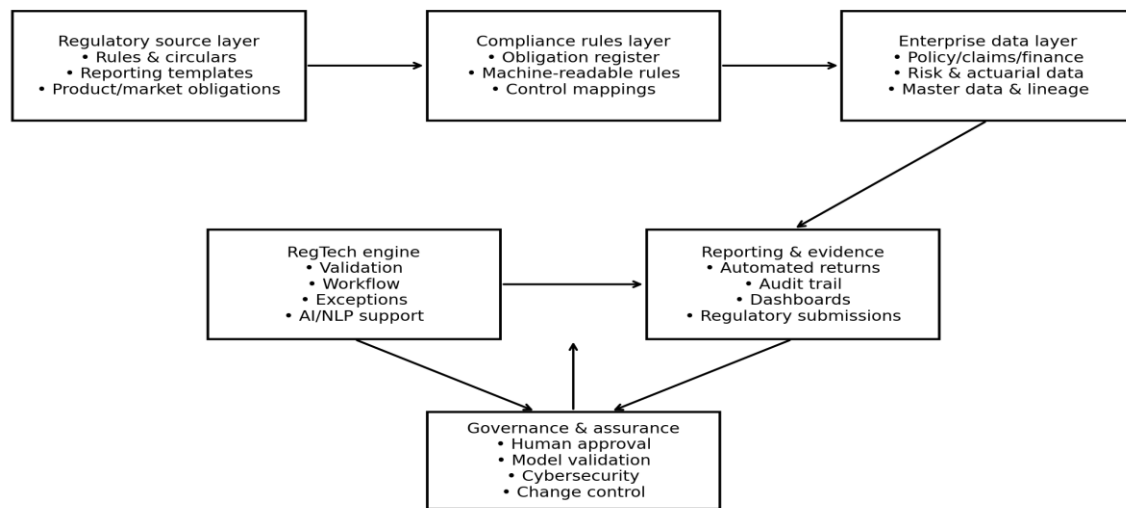


Figure 3. Proposed Saudi Insurance RegTech and Automated Compliance Reporting Architecture.

Source: Author's synthesis of the reviewed literature and Saudi regulatory context.

Table 3. RegTech capability model for Saudi insurers

Capability	Core components	Primary benefit	Principal risk
Regulatory knowledge	Obligation register, applicability, rule versioning	Clearer control ownership and change management	Misinterpretation of legal requirements
Data governance	Dictionary, ownership, lineage, quality rules	Accurate and reproducible reporting	Inconsistent definitions or poor source data
Rules engine	Validations, thresholds, reconciliations	Faster detection of non-compliance and data errors	Incorrect coding or uncontrolled parameter changes
Workflow	Exceptions, escalation, approvals	Accountable issue resolution	Bypass, backlog or weak segregation of duties
AI/analytics	Text classification, anomaly detection, prioritization	Scalable analysis of complex information	Opacity, hallucination, bias or model drift
Evidence & reporting	Submission package, logs, audit trail	Improved traceability and supervisory response	Incomplete retention or evidence gaps

Table 4. Phased implementation roadmap and performance indicators

Phase	Priority actions	Example deliverable	Key KPI	Governance gate
1. Inventory	Map obligations, reports, owners and source systems	Regulatory obligation register	Coverage of material obligations	Compliance/legal approval
2. Standardize	Create data dictionary, lineage and common definitions	Regulatory data catalogue	Data-quality exception rate	Data-owner sign-off
3. Automate controls	Implement validation, reconciliation and exception workflow	Controlled reporting pipeline	Manual adjustments / cycle time	Control testing
4. Integrate	Connect reporting platform to approved digital channels	Structured submission process	Submission errors / response time	Cyber and access review
5. Optimize	Add analytics, NLP and continuous monitoring	Advanced RegTech dashboard	Repeat exceptions / model alerts	Model validation and periodic review

XI. DISCUSSION

The analysis indicates that RegTech creates value through three reinforcing mechanisms. First, it improves information quality by establishing common definitions, lineage and validation. Second, it improves process efficiency by reducing repetitive extraction, reconciliation and evidence gathering. Third, it improves governance by making obligations, exceptions and approvals more visible. These mechanisms only work together. Automation without governed data produces faster errors, while high-quality data without workflow integration leaves compliance dependent on manual effort.

Saudi Arabia's evolving supervisory infrastructure increases the relevance of this integrated model. TAMEEN has already expanded the range of regulatory and supervisory interactions that can be completed digitally. The National Insurance Sector Strategy goes further by envisioning modern infrastructure, sector-wide data capabilities, secure sharing and artificial intelligence. Insurers therefore have a strategic reason to modernize internal reporting even before every regulatory process becomes fully machine-to-machine.

The framework also clarifies the relationship between RegTech and SupTech. RegTech improves the regulated firm's ability to comply; SupTech improves the supervisor's ability to monitor. The two become more effective when data definitions and reporting standards are interoperable. A regulator receiving clean, structured and traceable information can analyze the market more quickly, while insurers benefit from clearer reporting expectations and fewer duplicative requests.

However, interoperability can also increase systemic dependency. If many firms rely on similar third-party platforms or standardized interfaces, a technology failure or cyber incident could affect multiple institutions simultaneously. Digital transformation therefore shifts some risk from manual process failure toward technology concentration and operational resilience. Supervisory modernization should consider this trade-off.

Another important implication is that compliance cost should not be evaluated only through staff reduction. Charoenwong et al. (2024) show that RegTech investment can require significant technology expenditure and can have broader operational

consequences. The economic value may instead appear as fewer reporting corrections, faster regulatory response, improved data reuse, stronger auditability and lower operational risk. Insurers should therefore use a multi-dimensional business case.

The framework also challenges the idea that regulatory reporting is a periodic back-office task. In a mature architecture, data quality and compliance are monitored continuously. A material data issue can be detected when it occurs rather than at quarter-end. Regulatory reporting becomes the final output of an ongoing control environment. This can improve both compliance and management information because the same governed data can support operational decision-making.

Finally, the analysis supports augmentation rather than substitution. Compliance professionals remain responsible for interpretation, proportionality, judgment and challenge. Technology is most valuable when it removes low-value repetition and gives specialists better evidence. The future compliance role therefore becomes more analytical and interdisciplinary, requiring understanding of regulation, data, systems and model risk.

XII. PRACTICAL, REGULATORY AND RESEARCH IMPLICATIONS

For insurance boards, the principal implication is that RegTech should be governed as part of the control framework, not delegated entirely to information technology. Boards and risk committees should receive reporting on material regulatory obligations, data-quality issues, automated-control failures, overrides and major technology dependencies.

For chief compliance officers, a structured obligation register should become the backbone of the compliance program. Each material obligation should be linked to a responsible owner, control, evidence source and reporting requirement. Compliance teams should prioritize automation according to determinism, volume, risk and data readiness.

For finance, actuarial and reporting functions, data lineage and reconciliation should be treated as permanent capabilities rather than annual projects. A

regulatory figure should be reproducible from source with documented transformations. This can reduce dependence on individual spreadsheet knowledge and improve continuity.

For technology leaders, architecture should favor secure integration, common taxonomies, version-controlled rules and observable workflows. Vendor selection should consider auditability and exit capability in addition to features. Where artificial intelligence is used, model governance should be proportionate to the consequence of error.

For the Insurance Authority, continued development of structured digital services, common data standards and secure integration can reduce reporting friction across the sector. Clear technical specifications and controlled transition periods can help smaller insurers adopt new requirements without disproportionate implementation risk. The Authority's Digital Maturity Measurement Project could also encourage firms to assess compliance technology as part of broader digital capability.

For researchers, Saudi Arabia offers a valuable setting for empirical study. Future research can measure the effect of RegTech maturity on reporting cycle time, error rates, compliance findings, administrative cost and supervisory response. Researchers can also compare firms before and after major digital-reporting implementations, study the determinants of adoption, or test whether standardized data reduce differences in interpretation across insurers.

XIII. LIMITATIONS

This study is conceptual and relies on secondary academic and official sources. It does not have access to confidential Saudi regulatory returns, insurer compliance costs, internal audit findings, TAMEEN transaction logs or supervisory case data. Consequently, it does not estimate a causal effect of RegTech on compliance performance.

The paper also distinguishes between current Saudi digital initiatives and recommended future architecture. TAMEEN and related Insurance Authority initiatives demonstrate digital-supervision progress, but the paper does not assume that every

reporting obligation is currently available as a fully machine-readable or real-time interface. The proposed rules engine, data taxonomy and continuous-control model are design recommendations.

RegTech evolves rapidly, particularly in generative artificial intelligence. Technical capabilities, regulatory expectations and cybersecurity risks may therefore change faster than academic publication cycles. Finally, some peer-reviewed evidence comes from banking or broader financial services rather than insurance. Future research should test the framework using Saudi insurer-level evidence and line-of-business differences.

XIV. CONCLUSION

Regulatory technology can become a central component of Saudi Arabia's insurance-sector digital transformation because it connects regulation, data, controls and reporting. Vision 2030 and the National Insurance Sector Strategy create a clear institutional direction: regulation should become more efficient, data should become more reliable and shareable, and advanced technology should support a stronger insurance market.

The paper shows that effective RegTech is not simply software that completes forms. It is an integrated compliance operating model. Regulatory requirements must be converted into structured obligations; report data must have clear ownership and lineage; validation rules must be transparent; exceptions must be investigated; approvals must remain accountable; and every submission must preserve reproducible evidence.

Automated compliance reporting can materially improve this model by reducing repeated extraction and reconciliation, shortening reporting cycles and improving traceability. TAMEEN's expansion from 36 publicized digital services at launch in February 2025 to 51 after the December 2025 expansion demonstrates the Insurance Authority's broader movement toward digital regulatory interaction. The Insurance Data Hub, Integration Platform, Digital Maturity Measurement Project and 2026 artificial-intelligence collaboration reinforce the same direction. The proposed Saudi Insurance RegTech and

Automated Compliance Reporting Framework therefore combines six layers: regulatory sources, compliance rules, enterprise data, RegTech execution, reporting evidence, and governance assurance. It adopts a compliance-by-design principle while preserving human oversight for interpretation and material judgment.

The most important implementation principle is controlled automation. Deterministic and repetitive requirements should be automated aggressively where data are mature. Judgment-intensive or high-impact requirements should use technology for evidence and decision support while retaining human sign-off. Artificial intelligence should be adopted selectively and governed through validation, explainability and change control.

For Saudi insurers, this model can improve regulatory responsiveness and operational resilience while allowing compliance professionals to focus on higher-value interpretation and risk analysis. For the regulator, better-structured and traceable information can support more effective supervision. For researchers, the next step is empirical validation using measurable outcomes such as reporting corrections, cycle time, exceptions, costs and supervisory findings. A mature RegTech environment is therefore not defined by the absence of people or manual judgment. It is defined by the presence of reliable data, transparent rules, controlled workflows, accountable decisions and evidence that can be reproduced. These characteristics are consistent with the wider Vision 2030 objective of building digitally enabled, efficient and resilient financial institutions.

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