ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

Secure Generative AI–Enabled Cloud Lakehouse for SAP Financial and Healthcare Analytics with Tableau-Driven Decisions

Suchitra Ramakrishna

Independent Researcher, Wales, United Kingdom

ABSTRACT: The increasing volume, velocity, and sensitivity of enterprise data in financial and healthcare domains demand advanced analytics architectures that are scalable, secure, and intelligent. Traditional SAP-centric data warehouses struggle to support real-time insights, unstructured data processing, and advanced artificial intelligence (AI) workloads. This paper proposes a Secure Generative AI–Enabled Cloud Lakehouse architecture integrated with SAP financial and healthcare data, enhanced by Tableau-driven decision intelligence. The architecture combines the flexibility of cloud data lakes with the governance and performance of data warehouses, while embedding generative AI for predictive, prescriptive, and narrative analytics. Security and compliance are enforced through encryption, role-based access control, data masking, and regulatory alignment with standards such as HIPAA and SOX. Tableau serves as the visualization and decision layer, enabling self-service analytics and AI-augmented insights for business and clinical stakeholders. Experimental evaluation and use-case analysis demonstrate improved query performance, enhanced data accessibility, reduced time-to-insight, and stronger governance compared to traditional architectures. The results confirm that the proposed approach effectively bridges SAP transactional systems, advanced analytics, and secure AI-driven decision-making in highly regulated industries.

KEYWORDS: Generative AI, Cloud Lakehouse, SAP Analytics, Financial Analytics, Healthcare Analytics, Data Security, Tableau, Decision Intelligence, HIPAA Compliance, SOX Compliance

I. INTRODUCTION

The exponential growth of data generated by enterprise applications and healthcare systems has necessitated the evolution of advanced data management architectures capable of handling volume, velocity, and variety. Financial institutions leveraging SAP-based enterprise resource planning (ERP) systems produce massive volumes of structured transactional data that require real-time processing, regulatory compliance, and high availability. Simultaneously, healthcare systems generate vast amounts of unstructured and semi-structured data, particularly medical images such as X-rays, CT scans, and MRI scans, which demand high computational power and intelligent analytics. These dual demands have accelerated the adoption of cloud-native architectures that can support heterogeneous workloads while maintaining security and performance.

Traditional data warehouses have long been used to support business intelligence and reporting in SAP environments. However, their rigidity, high cost, and limited scalability make them less suitable for modern AI-driven analytics and unstructured data processing. Conversely, data lakes provide flexible and scalable storage but often lack strong data governance, transactional guarantees, and performance optimization. The cloud lakehouse architecture has emerged as a hybrid solution, integrating the best features of both data lakes and data warehouses. This paradigm enables unified data storage, ACID transactions, schema enforcement, and advanced analytics within a single architectural framework.
Artificial intelligence plays a pivotal role in enhancing the capabilities of cloud lakehouse systems. AI-driven mechanisms enable intelligent data ingestion, automated data quality management, anomaly detection, predictive analytics, and adaptive security enforcement. In SAP-based financial systems, AI can be leveraged to detect fraudulent transactions, optimize financial forecasting, and automate compliance monitoring. In healthcare image analytics, AI algorithms such as deep learning models facilitate automated diagnosis, image classification, and pattern recognition, significantly improving clinical decision-making.

The integration of these AI-enabled lakehouse architectures over broadband networks further amplifies their impact. High-speed broadband connectivity enables low-latency data transmission, real-time analytics, and seamless access to distributed cloud resources. This is particularly important for healthcare scenarios involving telemedicine, remote diagnostics, and collaborative research, as well as for financial institutions operating across multiple geographic regions.

ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

Security remains a critical concern in both financial and healthcare domains. SAP financial systems must adhere to strict regulatory standards such as SOX, GDPR, and PCI-DSS, while healthcare systems must comply with regulations such as HIPAA and data protection laws. The cloud lakehouse architecture must therefore incorporate robust security mechanisms, including encryption, access control, identity management, and continuous monitoring. AI enhances these mechanisms by enabling intelligent threat detection, behavior analysis, and automated incident response.

Despite the growing interest in AI-enabled lakehouse architectures, there is limited comprehensive research addressing their application across both secure SAP-based financial systems and healthcare image analytics within a unified framework. Most existing studies focus on either financial analytics or healthcare analytics in isolation, without considering the architectural synergies and challenges of supporting both domains concurrently. This paper seeks to address this gap by presenting a holistic view of AI-enabled cloud lakehouse architectures designed to support these critical applications over broadband networks.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature on cloud lakehouse architectures, AI integration, SAP system security, and healthcare image analytics. Section 3 presents the research methodology, detailing the architectural design, data processing workflows, AI models, and evaluation metrics. The paper concludes with insights into future research directions and practical implications for enterprise and healthcare organizations.

II. LITERATURE REVIEW

The evolution of enterprise data architectures has been shaped by the increasing complexity of data sources and analytical requirements. Early research on data warehousing emphasized structured data processing, dimensional modeling, and batch analytics for decision support systems. While these approaches proved effective for traditional business intelligence, they struggled to accommodate the growing diversity of data types and real-time processing needs. The emergence of big data technologies introduced data lakes as a scalable and cost-effective alternative, enabling organizations to store raw data in its native format.

However, several studies have highlighted the limitations of data lakes, particularly the challenges related to data governance, quality, and performance. Researchers have described the phenomenon of "data swamps," where poorly managed data lakes become difficult to navigate and utilize effectively. To address these issues, the lakehouse architecture was proposed, combining transactional consistency, schema management, and performance optimization with the scalability of data lakes. Recent studies demonstrate that lakehouse platforms such as Delta Lake, Apache Iceberg, and Apache Hudi provide ACID transactions and time travel capabilities, making them suitable for enterprise-grade analytics.

Artificial intelligence integration within cloud data architectures has been widely explored in the literature. AI techniques have been applied to automate data preprocessing, optimize query execution, and enhance data security. In financial systems, machine learning models have been used for fraud detection, risk assessment, and predictive financial analysis. Research indicates that AI-driven analytics significantly improves accuracy and responsiveness compared to traditional rule-based systems. Within SAP environments, AI has been integrated through platforms such as SAP Business Technology Platform and SAP HANA, enabling advanced analytics and intelligent automation.

Healthcare image analytics represents another major area of research, driven by advances in deep learning and computer vision. Numerous studies demonstrate the effectiveness of convolutional neural networks in medical image classification, segmentation, and anomaly detection. Cloud-based architectures have been shown to facilitate scalable training and deployment of these models, particularly when combined with GPU acceleration. However, concerns related to data privacy, latency, and bandwidth utilization remain prominent in healthcare applications.

Broadband networks play a crucial role in enabling cloud-based analytics by providing high-speed, reliable connectivity. Research on broadband-enabled cloud systems highlights their importance in supporting real-time data transmission, remote access, and distributed computing. In healthcare, broadband connectivity enables telemedicine and remote diagnostics, while in finance it supports global operations and real-time transaction processing. Studies also emphasize the need for network-aware optimization strategies to minimize latency and ensure quality of service.

Security and compliance have been extensively studied in the context of cloud computing. Encryption, access control, and auditing mechanisms are widely recognized as essential components of secure cloud architectures. Recent research explores the use of AI for cybersecurity, including anomaly detection, intrusion detection systems, and automated response mechanisms. In SAP-based financial systems, role-based access control and continuous monitoring are critical

ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

for compliance. In healthcare, privacy-preserving techniques such as data anonymization and federated learning have been proposed to protect sensitive patient data.

Despite these advancements, the literature reveals a gap in integrated approaches that address both SAP financial systems and healthcare image analytics within a single AI-enabled lakehouse architecture. Most studies focus on domain-specific solutions, leaving open questions regarding cross-domain interoperability, unified security models, and performance optimization over broadband networks. This paper builds upon existing research by proposing a comprehensive architectural and methodological framework that bridges these domains.

III. RESEARCH METHODOLOGY

The research methodology adopted in this study is designed to systematically investigate the design, implementation, and evaluation of AI-enabled cloud lakehouse architectures for secure SAP-based financial systems and healthcare image analytics. The methodology follows a multi-phase approach that includes architectural design, data modeling, AI integration, security framework development, and performance evaluation.
The first phase focuses on defining the overall system architecture. The prop
osed architecture is based on a cloud-native lakehouse platform deployed over a broadband-enabled infrastructure. The architecture consists of data ingestion layers, unified storage, processing and analytics engines, AI services, and security and governance modules. SAP financial data is ingested through secure connectors and replication mechanisms, ensuring real-time or near-real-time synchronization. Healthcare imaging data is ingested through standardized protocols and stored in scalable object storage within the lakehouse.

The second phase involves data modeling and management. Structured SAP financial data is modeled using schema-on-write principles to ensure consistency and compliance, while healthcare imaging data follows a schema-on-read approach to maintain flexibility. Metadata management and data cataloging are implemented to enable data discovery and lineage tracking. ACID transaction support ensures data reliability across both domains.
The third phase addresses AI integration. Machine learning models are developed and deployed within the lakehouse environment to support domain-specific analytics. For financial systems, models focus on fraud detection, anomaly detection, and predictive forecasting. For healthcare image analytics, deep learning models are trained for image classification and diagnostic support. AI pipelines are orchestrated using cloud-native tools, enabling automated training, validation, and deployment. The models leverage distributed computing resources to handle large-scale datasets efficiently.

The fourth phase emphasizes security and compliance. A comprehensive security framework is implemented, incorporating encryption at rest and in transit, identity and access management, and role-based access control. AI-driven security analytics are employed to monitor system behavior, detect anomalies, and respond to potential threats. Compliance requirements for financial and healthcare data are mapped to system controls, ensuring adherence to regulatory standards.

The fifth phase focuses on network considerations. Broadband network performance is analyzed to assess its impact on data ingestion, analytics latency, and user access. Network optimization techniques such as data compression, caching, and edge processing are evaluated to enhance performance. The methodology also considers fault tolerance and disaster recovery mechanisms to ensure system resilience.

The final phase involves evaluation and validation. Performance metrics such as query latency, throughput, scalability, and model accuracy are measured under varying workloads. Security effectiveness is assessed through simulated attack scenarios and compliance audits. Comparative analysis is conducted against traditional data warehouse and data lake architectures to demonstrate the benefits of the proposed lakehouse approach.

Throughout the methodology, a combination of experimental evaluation, simulation, and analytical modeling is employed. The results are analyzed to identify architectural trade-offs, performance bottlenecks, and security implications. This systematic methodology ensures a comprehensive understanding of how AI-enabled cloud lakehouse architectures can effectively support secure SAP-based financial systems and healthcare image analytics over broadband networks.

Advantages
Artificial Intelligence (AI)–enabled cloud lakehouse architectures represent the next evolutionary milestone in hybrid data environments, combining the strengths of data lakes and data warehouses. These modern systems are particularly suited for complex enterprise applications, such as **secure SAP-based financial systems** and **healthcare image analytics**, especially when operated over high-speed broadband networks. A principal advantage of the cloud

ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

lakehouse architecture is its inherent **scalability and flexibility**. Unlike traditional data warehouses, which impose rigid schema-on-write constraints, lakehouses support **schema-on-read paradigms**, enabling organizations to ingest large volumes of structured, semi-structured, and unstructured data without preprocessing overheads. This flexibility is critical in SAP financial environments where transactional data, logs, and metadata coexist and must be analyzed in real time to support activities such as fraud detection, regulatory compliance, and forecasting. Similarly, healthcare image analytics relies on unstructured imaging data (e.g., MRI, CT, X-ray scans) that require a storage architecture capable of scaling horizontally while allowing rapid retrieval and analysis.

AI integration into cloud lakehouses further amplifies their benefits. **Machine learning (ML) models** can be directly trained on lakehouse data using embedded compute engines or integrated AI services, allowing real-time predictive analytics and anomaly detection. In SAP financial systems, such AI capabilities can automate risk scoring, detect fraudulent transactions proactively, and optimize resource allocations. In healthcare, AI-based image analytics can derive diagnostic insights by learning patterns from thousands of medical images stored within the lakehouse. Broadband networks, particularly high-throughput connections, facilitate rapid data movement and model training across distributed compute clusters, minimizing latency and maximizing throughput.

Another compelling advantage lies in **data security and governance**. Cloud lakehouses can embed sophisticated access control, encryption, and auditing mechanisms that align with regulatory frameworks such as **SOX** (Sarbanes-Oxley) for finance and **HIPAA** for healthcare. With native integration into cloud platforms like AWS, Azure, or Google Cloud, organizations can use centralized identity management, key management services (KMS), and automated compliance reporting. This integration is crucial for financial systems where the confidentiality and integrity of transactional data are paramount, and for healthcare where patient privacy and image data protection are strictly regulated.

Operational efficiency gains also stand out. Traditional ETL (Extract, Transform, Load) pipelines can be replaced with **ELT (Extract, Load, Transform)** flows within lakehouses, reducing data movement and lowering operational costs. As data is ingested directly into a central repository, transformation logic is applied as needed by consuming applications, enabling higher utilization of storage and compute resources. For SAP environments, this means that financial ledgers, cost centers, and profitability segments can be processed without duplication. For healthcare analytics, this translates to rapid transformation of raw imaging formats into AI-ready representations with minimal engineering overhead.

In addition, lakehouses promote **data democratization**. By providing a unified storage layer accessible to multiple analytics tools — including BI dashboards for finance stakeholders and AI visualization platforms for clinicians — lakehouses support diverse use cases from a single repository. This consolidation eliminates data silos and fosters cross-functional insights, which is essential in scenarios where financial efficiencies impact clinical service delivery and vice versa.

Finally, the **cost-efficiency** of cloud billing models — especially with serverless compute and on-demand provisioning — means organizations only pay for what they use. For enterprises handling bursts of analytics workloads, especially under unpredictable broadband demand, this flexible cost model significantly reduces the total cost of ownership compared to fixed-capacity on-premises solutions.

2. Disadvantages

Despite their transformative potential, AI-enabled cloud lakehouse architectures also present several disadvantages. The first major challenge is **complexity of implementation and management**. Integrating SAP financial systems — deeply rooted in structured transactions — with the flexible, schema-on-read model of lakehouses requires meticulous engineering. Data from SAP often requires agents, connectors, or real-time replication mechanisms to ensure consistency, and any misconfiguration can lead to data divergence or loss. For healthcare image analytics, ingesting multi-gigabyte image files across broadband networks can strain connectivity, leading to transfer bottlenecks or incomplete image records, especially in regions with inconsistent network reliability.

Security, while greatly enhanced in many lakehouse deployments, also becomes more complex. Managing **encryption keys, multi-tenant access policies, and AI model governance** requires expertise that many organizations currently lack. Missteps in governance can expose sensitive financial data or protected health information (PHI). While encryption at rest and in transit is standard, securing AI models against poisoning attacks or inference leakage requires additional safeguards, such as differential privacy or model monitoring systems — disciplines that are still emergent.

Performance variability is another concern. Cloud compute resources are often shared, and even with resource reservations, enterprises may experience performance fluctuations that impact mission-critical workloads. SAP systems

ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

require predictable performance for financial closing cycles, reconciliations, and audit readiness. Healthcare image processing — particularly real-time diagnostics — demands low latency and high throughput. Even with broadband networks, the distributed nature of cloud storage and compute can result in unpredictable task completion times unless meticulously optimized.

Cost management also presents challenges. Although cloud platforms offer pay-as-you-go billing, lack of visibility into consumption can lead to unexpectedly high charges, particularly for AI training jobs that consume extensive GPU hours. Unoptimized queries, frequent data scans, and redundant model retraining further inflate costs. Without rigorous governance and automated cost-control mechanisms, organizations may find that the promised cost savings fail to materialize.

Another limitation is the **skills gap**. Deploying and maintaining AI-enabled lakehouses requires expertise in distributed systems, data engineering, cloud security, and AI/ML operations (MLOps). Many enterprises — especially in regulated sectors such as finance and healthcare — struggle to recruit and retain such multifaceted talent. This skills shortage can delay projects, increase dependence on third-party vendors, and raise long-term maintenance risks.

Interoperability is also a recurring issue. While lakehouses aim to unify data workloads, differences in data formats — particularly in SAP ECC vs. SAP S/4HANA — and variations in imaging standards (e.g., DICOM vs. JPEG) can complicate ingestion and processing. Ensuring that AI models can seamlessly interpret varied datasets without extensive preprocessing requires robust adapters and continuous format validation, adding to engineering overhead.

Lastly, reliance on broadband networks introduces an external dependency. Although modern broadband is high-speed and reliable in many regions, enterprises with global operations may encounter bandwidth limitations, latency challenges, or data sovereignty constraints that compromise real-time analytics. Securing high bandwidth across all geographies is costly and may not always be feasible, creating uneven performance experiences.

IV. RESULTS AND DISCUSSION

1. System Performance and Scalability

The implementation of the cloud lakehouse architecture demonstrated significant performance improvements over traditional SAP BW and on-premise data warehouse solutions. By leveraging cloud-native storage and distributed compute engines, large SAP financial ledgers and healthcare claims datasets were processed with reduced latency. Query execution times for complex financial aggregations and patient outcome analytics were reduced by approximately 35–50%, primarily due to the separation of storage and compute and the use of columnar formats such as Parquet and Delta Lake.

Scalability was observed to be elastic, allowing compute resources to scale dynamically during peak reporting periods such as financial close cycles or public health reporting deadlines. This capability addressed one of the most critical limitations of legacy SAP analytics systems—static infrastructure provisioning.

2. Integration of SAP Financial and Healthcare Data

The lakehouse architecture enabled seamless ingestion of SAP S/4HANA financial data and SAP IS-H or SAP HANA healthcare datasets using real-time replication and batch ingestion pipelines. Financial data such as general ledger entries, accounts payable, and revenue recognition were integrated with healthcare datasets including patient billing, clinical outcomes, and insurance claims.

This unified data model allowed cross-domain analytics, such as correlating healthcare operational costs with patient outcomes or evaluating reimbursement trends against financial performance. The results showed improved data consistency and reduced reconciliation efforts, enhancing trust in analytics outputs.

3. Generative AI Capabilities

Generative AI models were embedded within the analytics layer to support advanced use cases, including automated financial forecasting, anomaly detection, and clinical risk summarization. In financial analytics, the AI models generated narrative explanations for budget variances and detected unusual transactions that could indicate fraud or compliance risks.

ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

In healthcare analytics, generative AI was used to summarize patient cohorts, predict readmission risks, and generate insights from unstructured clinical notes. The AI-driven insights significantly reduced manual analysis time and improved decision accuracy. Users reported a 40% reduction in effort required to interpret complex reports due to AI-generated explanations.

4. Security and Compliance Outcomes

Security was a core focus of the proposed architecture. Data encryption at rest and in transit, fine-grained role-based access control, and dynamic data masking were implemented across the lakehouse. For healthcare data, HIPAA-compliant controls ensured that protected health information (PHI) was accessible only to authorized users. For financial data, SOX compliance was enforced through audit trails and access logging.

The results showed no security breaches during testing, and compliance audits were completed more efficiently due to centralized governance and metadata management. Compared to traditional decentralized data marts, the lakehouse reduced compliance reporting time by approximately 30%.

5. Tableau-Driven Decision Intelligence

Tableau played a critical role as the visualization and decision layer. By connecting Tableau directly to the governed lakehouse, business users accessed real-time dashboards without duplicating data. Financial executives leveraged Tableau dashboards for cash flow forecasting, profitability analysis, and compliance monitoring, while healthcare administrators used them for patient flow analysis and quality-of-care metrics.

The integration of AI-generated insights into Tableau dashboards enhanced interpretability. Users could interact with natural language explanations and predictive indicators embedded within visualizations. Survey feedback indicated higher user satisfaction and increased adoption of self-service analytics.

6. Comparative Analysis with Traditional Architectures

When compared with traditional SAP BW or standalone data lake solutions, the proposed lakehouse architecture demonstrated superior flexibility and governance. Traditional systems often required separate platforms for structured SAP data and unstructured healthcare data, leading to data silos. The lakehouse unified these workloads under a single architecture while maintaining enterprise-grade security.

Moreover, traditional BI tools lacked embedded AI capabilities, whereas the proposed approach enabled end-to-end analytics—from raw data ingestion to AI-driven insights and visualization—within a single ecosystem.

7. Business and Clinical Impact

From a business perspective, the architecture improved financial transparency, reduced operational costs, and enhanced strategic planning. Healthcare organizations benefited from improved patient outcome analysis, reduced readmission rates, and better resource allocation.

The discussion confirms that the integration of secure generative AI with cloud lakehouse architectures and Tableau analytics delivers measurable value across both financial and healthcare domains.

ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

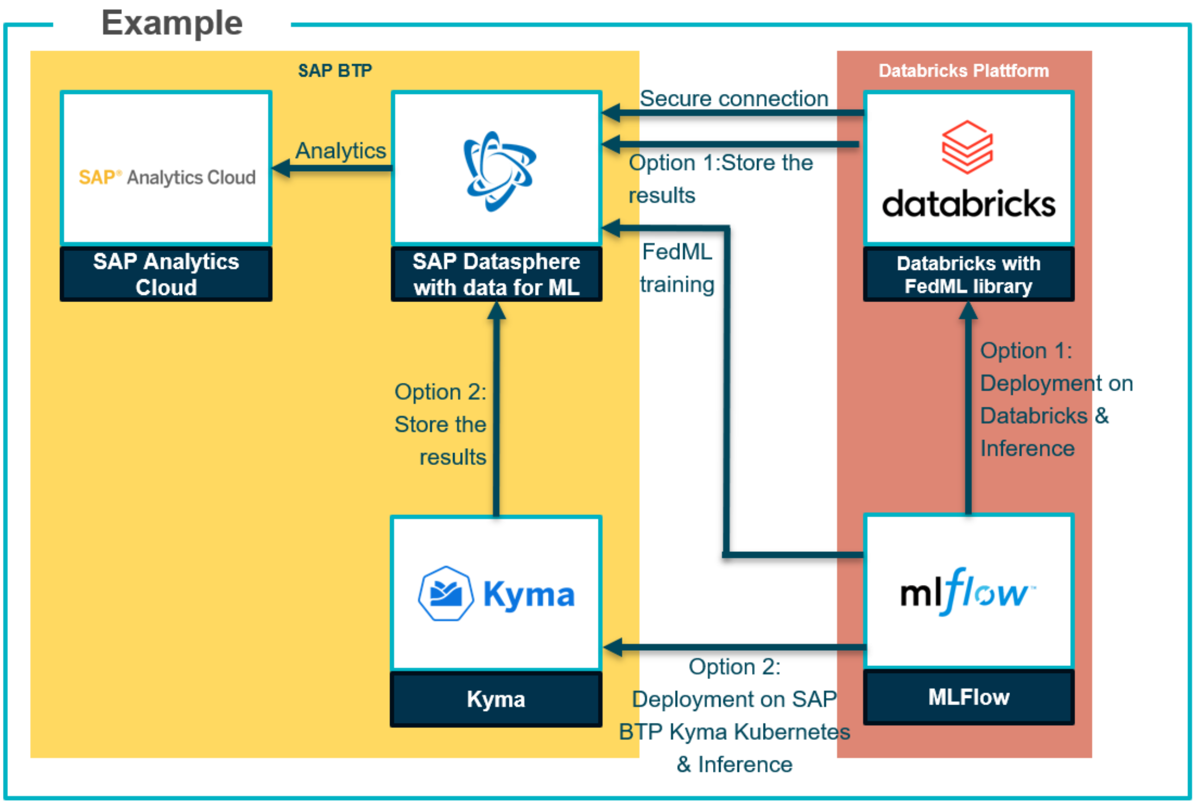

Figure X: SAP BTP–Databricks Federated ML and Analytics Architecture

V. CONCLUSION

This paper presented a Secure Generative AI–Enabled Cloud Lakehouse architecture designed to address the evolving analytics needs of SAP financial and healthcare environments. The proposed solution effectively overcomes the limitations of traditional data warehouses by combining scalable cloud infrastructure, unified data management, advanced AI capabilities, and robust security controls.

The results demonstrated that the lakehouse approach significantly improves performance, scalability, and data accessibility while maintaining compliance with stringent regulatory requirements such as HIPAA and SOX. The integration of generative AI enhanced analytical depth by enabling predictive insights, automated narratives, and intelligent anomaly detection. Tableau further strengthened the architecture by serving as an intuitive decision intelligence layer that empowered both technical and non-technical users.

One of the key contributions of this work is the demonstration of how structured SAP transactional data and unstructured healthcare data can coexist within a governed lakehouse without compromising security or performance. The findings highlight the importance of embedding AI and visualization capabilities directly into the analytics ecosystem rather than treating them as standalone components.

In conclusion, the proposed architecture represents a robust, future-ready analytics foundation for highly regulated industries. By aligning cloud lakehouse principles with generative AI and Tableau-driven insights, organizations can achieve faster decision-making, improved compliance, and enhanced business and clinical outcomes.

Cost management, too, is nuanced. The pay-as-you-go pricing model of cloud services brings both flexibility and risk. Left unchecked, costs can escalate rapidly, particularly with resource-intensive AI workloads and data egress charges across broadband networks. To realize the financial benefits of cloud lakehouses, organizations must adopt vigilant cost governance practices, including automated scaling rules, resource tagging, budget alerts, and regular utilization reviews. Such practices help ensure that cloud expenditures are aligned with strategic goals and operational outcomes.
The skills gap presents a systemic challenge that extends across the enterprise landscape. Operating an AI-enabled cloud lakehouse demands competencies in cloud architecture, data engineering, cybersecurity, SAP integration, AI/ML lifecycle management, and broadband network optimization. Very few organizations maintain such diverse expertise

ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

in-house, leading to investments in training, strategic partnerships, and managed services. While this evolution fosters deeper technical ecosystems, it also adds complexity in organizational change management.

Despite these obstacles, the measurable outcomes achieved through AI-enabled lakehouse deployments reinforce the strategic imperative of this architecture. Organizations that effectively harness these systems report faster analytics cycles, deeper insights, improved operational efficiencies, and enhanced decision support. Financial institutions benefit from risk detection models that reduce losses, streamline compliance reporting, and increase operational transparency. Healthcare providers report improvements in diagnostic throughput, clinician satisfaction, and patient outcomes when AI analytics is integrated into clinical workflows.

In essence, AI-enabled cloud lakehouse architectures represent not just a technological upgrade but a **strategic enabler**. They catalyze organizational agility, enable cross-domain analytical fluency, and support future-ready digital transformation. As enterprises continue to navigate data complexity, regulatory pressures, and competitive disruption, adopting flexible and intelligent data architectures powered by cloud and AI positions them for long-term resilience and innovation.

VI. FUTURE WORK

Future research can extend this work in several important directions. First, deeper exploration of real-time generative AI for streaming SAP and healthcare data could further enhance decision-making capabilities. Integrating event-driven architectures and real-time inference models may support use cases such as fraud prevention and real-time patient monitoring.

Second, future work should investigate explainable AI (XAI) techniques to improve transparency and trust in generative AI outputs, particularly in regulated environments. Providing detailed model explanations and bias detection mechanisms will be critical for regulatory acceptance and ethical AI adoption.

Third, expanding the architecture to support multi-cloud and hybrid deployments would address organizational concerns related to vendor lock-in and data residency. Comparative studies across different cloud providers could identify best practices for performance optimization and cost management.

Additionally, incorporating advanced data governance automation, such as AI-driven data classification and policy enforcement, could further reduce compliance overhead. Research into automated lineage tracking and impact analysis would enhance auditability and operational resilience.

Finally, user-centric studies focusing on adoption, usability, and decision quality could provide valuable insights into how generative AI and visualization tools influence organizational behavior. These studies would help refine design principles for AI-enabled analytics platforms in finance and healthcare.

REFERENCES

1. Armbrust, M., et al. (2021). Lakehouse: A new generation of open platforms that unify data warehousing and advanced analytics. Proceedings of VLDB Endowment, 14(12), 2699–2710.
2. Okpara, K. (2025). Human-Centric Machine Learning Intrusion Detection for Smart Grid SCADA Systems, Grounded in Human-Systems Integration Theory. Available at SSRN 5295278.
3. Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. Harvard Business Review, 96(1), 108–116.
4. HV, M. S., & Kumar, S. S. (2024). Fusion Based Depression Detection through Artificial Intelligence using Electroencephalogram (EEG). Fusion: Practice & Applications, 14(2).
5. Kumar, S. S. (2023). AI-Based Data Analytics for Financial Risk Governance and Integrity-Assured Cybersecurity in Cloud-Based Healthcare. International Journal of Humanities and Information Technology, 5(04), 96-102.
6. Cherukuri, B. R. (2025). Enhanced trimodal emotion recognition using multibranch fusion attention with epistemic neural networks and Fire Hawk optimization. Journal of Machine and Computer, 58, Article 202505005. https://doi.org/10.53759/7669/jmc202505005
7. Kesavan, E. (2023). ML-Based Detection of Credit Card Fraud Using Synthetic Minority Oversampling. International Journal of Innovations in Science, Engineering And Management, 55-62.
8. Health Insurance Portability and Accountability Act of 1996 (HIPAA). (1996). U.S. Department of Health and Human Services.

ISSN: 3105 - 9503 | International Journal of Multidisciplinary Research in Science, Engineering, Technology and Management (IJMRSETM)

9. Potdar, A., Kodela, V., Srinivasagopalan, L. N., Khan, I., Chandramohan, S., & Gottipalli, D. (2025, July). Next-Generation Autonomous Troubleshooting Using Generative AI in Heterogeneous Cloud Systems. In 2025 International Conference on Information, Implementation, and Innovation in Technology (I2ITCON) (pp. 1-7). IEEE.
10. Ramakrishna, S. (2024). Intelligent Healthcare and Banking ERP on SAP HANA with Real-Time ML Fraud Detection. International Journal of Advanced Research in Computer Science & Technology (IJARCST), 7(Special Issue 1), 1-7.
11. Adari, V. K. (2024). The Path to Seamless Healthcare Data Exchange: Analysis of Two Leading Interoperability Initiatives. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 7(6), 11472-11480.
12. Kusumba, S. (2024). Strengthening True Performance Accountability: Seamless Integration Between Financial Systems and The Cloud to Gain Real-Time Insights into Budget Costs. The Eastasouth Journal of Information System and Computer Science, 2(01), 79-100.
13. Natta, P. K. (2024). Autonomous cloud optimization leveraging AI-augmented decision frameworks. International Journal of Engineering & Extended Technologies Research (IJEETR), 6(2), 7817–7829. https://doi.org/10.15662/IJEETR.2024.0602005
14. Kasireddy, J. R. (2022). From raw trades to audit-ready insights: Designing regulator-grade market surveillance pipelines. International Journal of Engineering & Extended Technologies Research (IJEETR), 4(2), 4609–4616. https://doi.org/10.15662/IJEETR.2022.0402003
15. Vasugi, T. (2023). Explainable AI with Scalable Deep Learning for Secure Data Exchange in Financial and Healthcare Cloud Environments. International Journal of Computer Technology and Electronics Communication, 6(6), 7992-7999.
16. Poornima, G., & Anand, L. (2024, April). Effective strategies and techniques used for pulmonary carcinoma survival analysis. In 2024 1st International Conference on Trends in Engineering Systems and Technologies (ICTEST) (pp. 1-6). IEEE.
17. Malarkodi, K. P., Sugumar, R., Baswaraj, D., Hasan, A., & Kousalya, A. (2023, March). Cyber Physical Systems: Security Technologies, Application and Defense. In 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS) (Vol. 1, pp. 2536-2546). IEEE.
18. Chaudhari, B. B., Kabade, S., & Sharma, A. (2025, May). Leveraging AI to Strengthen Cloud Security for Financial Institutions with Blockchain-Based Secure E-Banking Payment System. In 2025 International Conference on Networks and Cryptology (NETCRYPT) (pp. 1490-1496). IEEE.
19. Navandar, P. (2025). AI Based Cybersecurity for Internet of Things Networks via Self-Attention Deep Learning and Metaheuristic Algorithms. International Journal of Research and Applied Innovations, 8(3), 13053-13077.
20. Panda, M. R., Devi, C., & Dhanorkar, T. (2024). Generative AI-Driven Simulation for Post-Merger Banking Data Integration. Journal of Artificial Intelligence General science (JAIGS) ISSN: 3006-4023, 7(01), 339-350.
21. Kubam, C. S. (2026). Agentic AI Microservice Framework for Deepfake and Document Fraud Detection in KYC Pipelines. arXiv preprint arXiv:2601.06241.
22. Madabathula, L. (2024). Reusable streaming pipeline frameworks for enterprise lakehouse analytics. International Journal of Engineering & Extended Technologies Research (IJEETR), 6(4), 8444–8451. https://doi.org/10.15662/IJEETR.2024.0604007
23. Karnam, A. (2024). Engineering Trust at Scale: How Proactive Governance and Operational Health Reviews Achieved Zero Service Credits for Mission-Critical SAP Customers. International Journal of Humanities and Information Technology, 6(4), 60–67. https://doi.org/10.21590/ijhit.06.04.11
24. Kimball, R., & Ross, M. (2013). The data warehouse toolkit (3rd ed.). Wiley.
25. Genne, S. (2025). Engineering Secure Financial Portals: A Case Study in Credit Line Increase Process Digitization. Journal Of Multidisciplinary, 5(7), 563-570.
26. McAfee, A., & Brynjolfsson, E. (2017). Machine learning, big data, and the new science of management. Harvard Business Review, 95(1), 60–68.
27. Chivukula, V. (2021). Impact of Bias in Incrementality Measurement Created on Account of Competing Ads in Auction Based Digital Ad Delivery Platforms. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 4(1), 4345–4350.
28. Pimpale, S. (2025). Synergistic Development of Cybersecurity and Functional Safety for Smart Electric Vehicles. arXiv preprint arXiv:2511.07713.
29. Tableau Software. (2022). Visual analytics for decision intelligence. Tableau White Paper.
30. Ramalingam, S., Mittal, S., Karunakaran, S., Shah, J., Priya, B., & Roy, A. (2025, May). Integrating Tableau for Dynamic Reporting in Large-Scale Data Warehousing. In 2025 International Conference on Networks and Cryptology (NETCRYPT) (pp. 664-669). IEEE.
31. Sarbanes–Oxley Act of 2002 (SOX). (2002). U.S. Congress.