Journal of Computer Science and Technology Studies
ISSN: 2709-104X
DOI: 10.32996/jcsts
Journal Homepage: www.al-kindipublisher.com/index.php/jcsts

JCSTS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Architecting Out Non-Compliance in SAP S/4HANA Transformation Programs: An AI-Driven Approach

Rahul Bhatia
Senior IEEE Member, Independent Researcher, United Kingdom
Corresponding Author: Rahul Bhatia, **E-mail**: rahul.bhatia20@ieee.org

| ABSTRACT

Transformation with SAP S/4HANA provides organizations with a strategic opportunity to integrate compliance within their digital core, as opposed to addressing it reactively once the system is implemented. With this potential in mind, flexibility in legacy compliance gaps is apportioned to many transformation programs, thereby subjecting organizations to regulatory infringement, audit failures, and reputational losses. Through Artificial Intelligence (AI)-powered governance frameworks, this paper discusses how institutions can take the initiative of ensuring non-compliance is removed even before the S/4HANA migration takes place. It highlights how compliance-by-design can be integrated into blueprinting and configuration processes, utilizing predictive risk analytics to identify anomalous transactions, automating regulatory tasks such as statutory reporting and contract validation, and enabling real-time monitoring of policy breaches and ESG performance measures. Additionally, it emphasizes the support of dynamic regulatory data feeds to keep compliance rules up to date with changing laws. Integrating AI, automation, and continuous surveillance helps organizations make their operations efficient while maintaining high compliance. The practical business advantages revealed in the study also include quicker audit cycles, reduced manual compliance, and ongoing visibility to both the auditor and management. By the end of the day, this will help shift compliance from a reactive requirement to an actionable strategic driver, confidently transforming S/4HANA implementations into operational excellence and regulatory rigor.

| KEYWORDS

SAP S/4HANA Transformation, Compliance-by-Design, Regulatory Automation, AI-Driven Risk Management.

| ARTICLE INFORMATION

ACCEPTED: 01 August 2025 **PUBLISHED:** 28 August 2025 **DOI:** 10.32996/jcsts.2025.7.9.3

1. Introduction

The global introduction of SAP S/4HANA marks a turning point in the modernization of organizations' business processes, standardization, and data flow optimization. Although the main aim of these programs is standardization of the process, migration of data, and continuity of business, compliance is often an afterthought or only considered later during implementation. Such a reactive nature will tend to cause organizations to bring forward legacy control weaknesses, implement manual workarounds to meet the audit demands and have a shaky compliance within regulatory frameworks like the Sarbanes-Oxley Act (SOX), International Financial Reporting Standards (IFRS), Generally Accepted Accounting Principles (GAAP), the General Data Protection Regulation (GDPR), and environmental, social and governance (ESG) requirements.

The outcomes of this non-immediate compliance integration may be severe. Organizations run the risk of exposing themselves to regulatory fines and inefficiencies caused by outdated controls, as well as the failure of their audits, which can further result in reputational losses. In addition, gaps in compliance may hinder the organization's ability to leverage real-time analytics, automated reporting, and predictive analytics, as S/4HANA, which reduces the strategic value of the shift.

Copyright: © 2025 the Author(s). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) 4.0 license (https://creativecommons.org/licenses/by/4.0/). Published by Al-Kindi Centre for Research and Development, London, United Kingdom.

To overcome these difficulties, organizations will need to take a 'compliance-by-design approach, in which regulatory and governance requirements become embedded in the transformation at the very beginning. This practice ensures that each process, configuration, and point of integration is configured to comply with current and emerging regulations. The benefit of embedding compliance early is that it is possible to prioritize high-risk transactions, validate master data, and align with global control frameworks, thereby reducing the risk of fragmentation or non-standardization in local business units.

In addition, organizations can utilize emerging technologies, such as AI and Machine Learning, which enable them to manage compliance within S/4HANA programs more effectively. Predictive analytics has the potential to identify future audit problems before they arise. Intelligent automation can be used to optimize statutory reports and contracts. Real-time dashboards can provide continuous monitoring of key compliance indicators. Organizations adopting these technologies can also turn their compliance into a proactive activity by making it a value-add rather than a bureaucratic process, making its digital core audit-friendly and driven to facilitate organizational growth that scales well.

To conclude, viable financial and operational modernization with the help of SAP S/4HANA cannot happen without the point of departure set on compliance. With governance, automation, and AI-driven monitoring implemented as part of the transformation program, organizations can eliminate legacy control gaps, minimize manual efforts, and achieve operational efficiency and regulatory assurance, which forms the basis of sustainable and compliant business processes in the fast-changing regulatory environment.

2. The Compliance Risk in S/4HANA Transformations

Such programs as SAP S/4HANA transformation offer high prospects for operational effectiveness, data-driven processes, and business standardization. They are, however, also prone to some degree of compliance risks, which, unless actively countered, can expose organizations to regulatory, financial, and reputational vulnerabilities (Dalal, 2025).

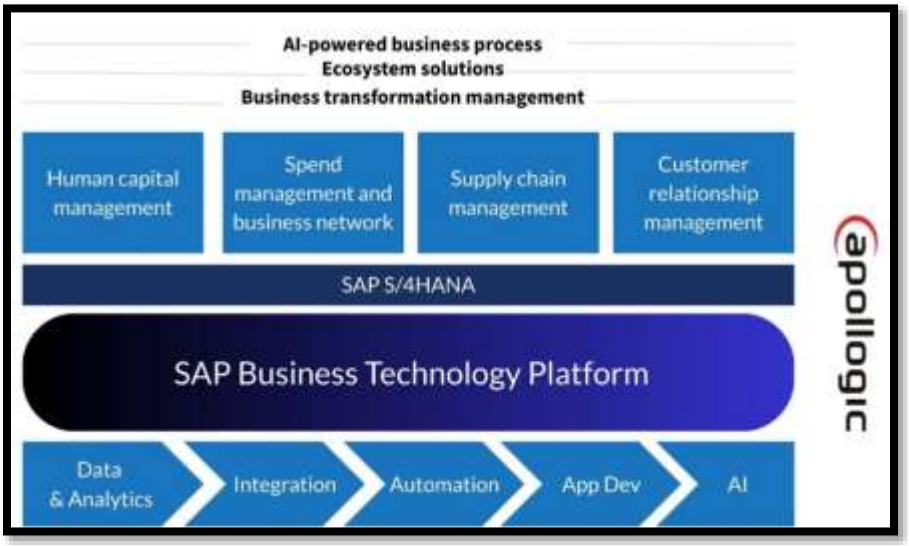

Figure 1: Compliance Risk in S/4HANA Transformations
(Source: apollogic.com, 2025)

Fit-to-standard misalignment has been a frequent cause of compliance breaches. Organizations are found to be customizing S/4HANA configurations without necessarily comprehending how SAP's best practices incorporate internal controls. To cite an example, standard SAP functions, such as three-way matching in procurement or the automatic segregation of duties, are designed to be set up to ensure compliance. Non-compliance with any of these standards, whether due to perceived local needs or a lack of change management, may compromise the effectiveness of the control and leave the organization with unmonitored transactional risks.

Data Quality Gaps are high-quality and stable master data remain the basis of reliable reporting, readiness to conduct audits, and compliance with regulations (Abdel, Aziz, & Andriansyah, 2023). S/4HANA transformations create a web of increasing erroneous reporting through statutory reporting, taxation, and reporting on ESG issues, as they relate to inconsistencies in vendor records, customer accounts, product classifications, and financial ledgers.

Process Fragmentation occurs when local business units or subsidiaries apply local variations to standard processes, thereby avoiding global control mechanisms. This kind of fragmentation could be the result of legacy practices, disparities in local regulatory demands, or a shortage of standardized process documentation. The emergent functional silos may erode auditability, create gaps in reports, and hinder an overall view of how the entire enterprise maintains compliance.

Integration Blind Spots: Lots of organizations run hybrid IT environments with non-SAP systems providing data to the core S/4HANA. Otherwise, compromised or invalidated data may be incorporated into the company's payment and processing workflows without proper validation or reconciliation, which undermines the credibility of the reports and the effectiveness of the controls.

Finally, **Late-Stage Control Design**. It has been seen that compliance requirements satisfied during testing or post-go-live activities usually involve retrofits, manual workarounds, and unremedied delays (Cheng et al., 2025). Reactive compliance management could result in findings by auditors, penalties, or loss of reputation, as well as constrain the organization's capacity to deploy AI-driven monitoring and predictive risk analysis in its proactive risk management.

Figure 2: Late-Stage Control Design
(Source: compact.nl, 2025)

The transformation programs to S/4HANA are associated with various compliance risks due to misalignment of standards, data quality issues, the fragmented nature of process execution, gaps in integration, and implementation lag in control. Working with these risks will involve a proactive and holistic plan to integrate compliance in blueprinting, configuration, and operational processes of the transformation. Offering regulatory certainty and auditability, along with operational efficiency, mitigating these risks early will ensure that S/4HANA programs themselves become the enablers rather than the obstacles in achieving regulatory compliance.

3. Strategies to Eliminate Non-Compliance

Organizations need to go the extra mile with compliance in their SAP S/4HANA transformation programs to meet regulatory requirements and address associated risks. With the assistance of AI-powered technologies, automation, and real-time surveillance, one can achieve compliance effectively by proactively designing it, rather than remedying it. The strategies below offer ways organisations can incorporate compliance into all phases of the transformation process.

Strategy	Description	Key Actions / Examples	Benefits
3.1 Embed Compliance-by-Design	Integrate compliance into blueprinting and configuration stages rather than adding controls later.	- Activate SAP standard controls (e.g., three-way match, segregation of duties) - Configure validations for jurisdictional tax rules, IFRS/GAAP, ESG metrics	- Zero legacy control gaps - Consistent regulatory adherence - Audit-ready processes
3.2 Predictive Risk Analytics	Use AI and machine learning to identify potential compliance risks before they materialise.	- Detect unusual transactions or posting patterns - Forecast potential audit findings using historical data	- Early risk detection - Reduced audit findings - Proactive remediation
3.3 Automate Regulatory Processes	Implement intelligent automation to reduce manual compliance work.	- Electronic tax filing and statutory reporting - Contract and invoice validation using NLP	- 80% reduction in manual effort - Increased accuracy and traceability - Faster reporting cycles
3.4 Enable Real-Time Monitoring	Continuous tracking of compliance and ESG KPIs using dashboards and alerts.	- Policy breach detection dashboards - ESG and sustainability KPI tracking	- Immediate notification of violations - Enhanced transparency - Proactive governance
3.5 Integrate with Regulatory Data Feeds	Connect S/4HANA to external regulatory sources to stay up-to-date.	- APIs from tax authorities, ESG reporting bodies, and regulators - Automatic update of compliance rules	- Reduced risk of outdated controls - Improved operational efficiency - Audit-readiness and stakeholder trust

Table 1: AI-driven strategies to eliminate non-compliance

3.1 Embed Compliance-by-Design

Compliance-by-design will be embedded in the blueprints and configuration phase of the S/4HANA program. The inflexible type of transformation tends to postpone compliance factors until later stages, and as such, the kind of legacy control gaps is transferred (Cho & Ackom, 2025).

The most important measures include incorporating SAP standard controls for 3-way matching in procurement operations and separating duties in finance and HR modules. Modelling of these controls incorporates checks and balances to minimize the need for manual interventions or compensating controls. An illustration of this is the three-way match, where purchase orders, receipt of goods, and invoices are automatically verified before posting, thereby eliminating any possibility of making fraudulent and inaccurate payments.

Additionally, system validations must be set accordingly to the taxation practices in the jurisdiction, IFRS/GAAP posting, and ESG measures. It involves automating taxes by the region where they are applicable, validating accounting entries, and incorporating ESG reporting metrics into operational processes (Dawa, Neves, & Vicente, 2025).

3.2 Use Predictive Risk Analytics

Predictive risk analytics utilizes SAP Analytics Cloud and built-in Machine Learning algorithms to identify potential compliance issues proactively before they occur. They can use these analytics tools to monitor aberrant transactions or posting volume that might be symptoms of error, fraud, or policy abuse.

Figure 2: Use Predictive Risk Analytics
(Source: fastercapital.com, 2025)

Another essential advantage is the ability to predict or foresee the results of the audit before they occur. The problem can be prevented by analyzing historical audit findings, transaction trends, and control deviations using Machine Learning models to predict high-risk areas (Devi, 2025). It enables compliance, financial, and internal audit teams to prioritize interventions and minimize the possibility of expensive audit findings and regulatory penalties.

3.3 Automate Regulatory Processes

AI automation is designed to reduce the number of people involved in routine duties related to company compliance efforts and decrease the amount of human error in the process. Electronic filing of taxes and statutory reporting may also be automated to facilitate on-time compliance, which is subject to local rules. For example, S/4HANA can combine VAT reports from different jurisdictions, thereby reducing the administrative workload and increasing accuracy.

It is also possible to validate contracts and invoices through natural language processing (NLP). The algorithms built with NLP can extract important clauses and automatically check adherence to organizational policies, warning of non-adherence. It minimizes the risk of non-compliance with the agreements and ensures that the obligations under the contract align with corporate governance norms (Hussain Vali Buvvaji, Rama, & Durga, 2023).

3.4 Enable Real-Time Monitoring

Real-time monitoring is one of the most essential aspects of a compliance-first SAP S/4HANA migration, as it enables organizations to see in real-time how well they are complying with regulatory requirements and internal policies. The unification of interactive dashboards and automated alerts in the areas of finance, procurement, and ESG reporting modules enables organizations to monitor key compliance metrics, policy limits, and approvals in real-time. The proactive visibility also enables the detection of deviations or violations as they occur, allowing for their correction in real-time, which reduces the likelihood of compliance violations and organizational inefficiencies.

For example, breach of policy notification dashboards can alert finance or procurement departments immediately when transactions exceed predetermined thresholds, bypass mandatory controls, or fail to comply with segregation-of-duties rules (Ibrahim Yasser & Khalifa, 2025). Such an ability allows a quicker fix and involves improving the overall control environment.

Real-time monitoring also contributes to improved transparency and audit readiness, in addition to risk mitigation. Management and internal auditors can create reports at any time, review past trends, and demonstrate compliance with minimal manual work. Aspirational to real-time monitoring converts ex post regulation into ex ante regulation, where organizations can exercise some control over existing quality in operations and minimize the workload on manual compliance, thereby ensuring corporate accountability in a heavily regulated business environment.

3.5 Integrate with Regulatory Data Feeds

Within the changing regulatory environment today, organizations encounter frequent changes in tax codes, financial reporting standards, and ESG requirements. Inability to adapt quickly can lead to compliance violations, fines, and damage to reputation. The use of SAP S/4HANA, combined with data feeds of regulatory data, enables a proactive approach, allowing applications to require minimal effort to manage their compliance rules, validations, and reporting procedures effectively.

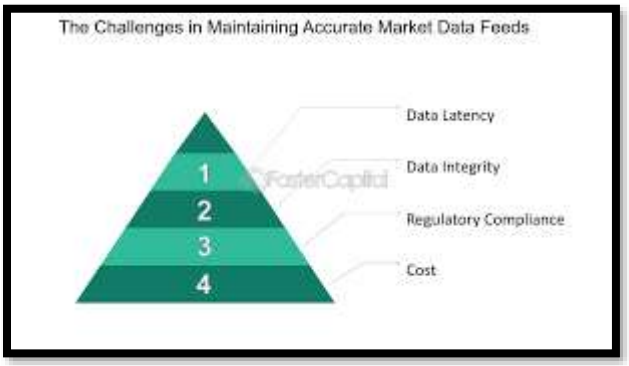

Figure 4: Integrate with Regulatory Data Feeds
(Source: fastercapital.com, 2025)

Tax authority APIs, environmental, social, and governance (ESG) reporting agency APIs, and other regulatory body APIs can automatically update system rules as part of S/4HANA (Karim & Saha, 2025).

Audit-readiness and operational efficiency are also enhanced and reinforced with such integration. Real-time updates enable the finance, compliance, and internal audit teams to receive timely updates regarding changes in regulations, create reports at the correct time, and demonstrate compliance during audits. Linking to dynamic regulatory data feeds, organizations are transforming compliance into a strategic capability that enables them to respond promptly to changes in law, manage their risk profile, and maintain stakeholder support as they continue to conduct scalable business across multiple jurisdictions.

4. Business Impact of Compliance-First Transformations

The use of a compliance-first strategy with SAP S/4HANA transformation programs has operational, financial, and strategic advantages. Integrating regulatory, governance, and compliance requirements into the design of systems will enable organizations to automate their processes, minimize manual efforts, and ultimately increase their audit readiness. Among the most evident ones is the speedup of the audit process (Kokogho, E., Odio, E., Ogunsola, O., & Nwaozomudoh, M. (n.d.)., 2025). Automatic compliance services like statutory reporting, contract approval, and tax submissions can cut audit preparation and performance time by 5070 percent. Auditors have direct access to validated, real-time data, thereby reducing the need for manual reconciliations and evidence collection.

The other significant payoff is the eradication of legacy control gaps. The weaknesses that legacy systems have may extend to traditional ERP transformations, and compliance issues may not be identified unless tackled proactively. The creation of compliance in the S/4HANA program enables the consolidation of these gaps to be addressed in the blueprinting and configuration processes, with zero legacy exposure. This preventive solution minimizes the chances of regulatory fines, financial misreporting, and damage to reputation, while instilling trust in stakeholders.

It also significantly reduces the manual effort of the organizations on compliance. With AI-driven analytics, intelligent automation, and real-time monitoring, as much as 80 percent of previously manual compliance work can now be managed or even avoided altogether. The workers will have more time to engage in value-added tasks, such as strategic decision-making, risk assessment, and process optimization, instead of performing repetitive tasks like validation. Not only does this increase efficiency, it also leads to a greater level of employee engagement and minimizes human error in key compliance functions.

Another strategic advantage is the constant visibility of compliance. Real-time dashboards and alerts will provide C-suite leadership, internal auditors, and compliance teams with continuous insight into their performance against both regulatory requirements and ESG standards. Such visibility enables making informed decisions as well as responding quickly when deviations approach management-level, and proactive management of risk exposure. In addition, it will assist in providing improved reporting to authorities, investors, and other parties in real-time that will increase organizational credibility and trust in regulated organizations.

Figure 5: S/4HANA Transformations Measurable
(Source: skill-mine.com, 2025)

The measurable improvements that increase with compliance-first S/4HANA transformations occur across several dimensions. The increased speed of the audit cycle, closure of legacy control gaps, minimal manual input, and real-time visibility- all contribute to the robustness of the organization's control environment. Depending on the compliance embedded throughout the digital core, organizations become not only efficient but also have a strategic edge in regulatory governance, risk management, and corporate accountability on day one.

5. Case Illustration

One of the significant manufacturing enterprises has recently conducted a global SAP S/4HANA upgrade affecting all of its production facilities worldwide. In a highly regulated environment, it is paramount that the organization prioritizes compliance, and as such, implements this by incorporating regulatory and governance requirements directly into the blueprinting and configuration steps (Sai Teja Nuka, 2024).

Automation of statutory processes in 22 countries is one of the attention-getting initiatives. Before the change, local finance departments manually provided reports to tax authorities, sometimes using spreadsheets and multiple disparate systems (Kyadasu, 2025). It was tedious, prone to mistakes, and difficult to audit. Through the use of S/4HANA integrated reporting and automatic intelligence features, the company can achieve standardization of the reporting process, adhere to local tax laws, and significantly decrease the time required to complete report preparation.

The organization also adopted predictive risk scoring with embedded Machine Learning and SAP Analytics Cloud. Such an alternative presented an opportunity for individuals in financial and compliance departments to detect 90 percent of high-risk postings prior to the period close, allowing for early action to rectify the situation. For example, anomalous purchase transactions, duplicate vendor invoices, and non-compliant journal entries were detected in real-time, thereby decreasing the probability of exceeding regulations and potential financial errors (Lukic Vujadinovic et al., 2024). The predictive models were continually updated with transactional and historical data, ensuring risk detection remained adaptive and precise throughout the transformation lifecycle.

Additionally, it implemented real-time dashboards to track ESG and sustainability KPIs across the entire enterprise. Before S/4HANA, the process of preparing ESG reporting took nearly 10 weeks due to data fragmentation and manual aggregation (Naman Dhariwal, Sengupta, N., M. Madiajagan, Kiran Kumar Patro, P. Lalitha Kumari, Nagwan Abdel Samee, Ryszard Tadeusiewicz, Paweł Pławiak, & Allam Jaya Prakash. (2024)). Stakeholders also had real-time visibility of information on environmental metrics, performance related to compliance and sustainability efforts, with integrated dashboards. The time taken to prepare ESG reports was also significantly improved, with a noticeable decrease in time to three weeks, which allowed for thorough reporting to regulators, investors, and internal leadership in a sufficient time, thereby increasing transparency and accountability.

In general, the case illustrates the effects of compliance integration at the earliest phases of the S/4HANA transformation, bringing specific business value. Predictive risk analytics, automated reporting, and real-time monitoring strengthened the organization's control environment, while also reducing manual labor and enhancing precision (Ngwu, Liu, & Wu, 2025). The process of designing compliance into the core of the digital environment helped the company achieve operational efficiency, regulatory confidence, and a strategic vision, offering other multinational corporations an example of how to transform their operations without compromising well-established compliance standards.

6. Conclusion

To eradicate non-compliance in SAP S/4HANA transformation programs, it is necessary to change the mentality, as the focus needs to be on architecting compliance at each step of the project, rather than adding it as an afterthought. Legacy gaps in control may compromise conventional reactive processes that meet regulatory demands, require additional manual effort, and pose a growing threat of audit failures. A regulatory-focused approach, by comparison, provides a compliance-first design that places regulatory conformance at the forefront of the blueprinting and configuration phase, as well as throughout go-live and ongoing operations.

The engagement of AI-powered analytics enables the company to detect anomalies, predict potential audit discoveries, and oversee high-risk transactions, eliminating them before they occur. Statutory reporting, tax returns, and contract validation are examples of recurring compliance processes that, through intelligent automation, can be simplified throughout their repetition to minimize manual labor while maximizing accuracy and auditability. It also offers real-time monitoring and dashboards, providing management and auditors with consistent capabilities to identify critical compliance measures and respond proactively to shifts and policy violations.

When incorporated into the technologies, compliance will no longer be a secondary requirement but a competitive edge. In addition to enhancing operational efficiency, scalability, and control environment, organizational transparency increases, along with stakeholder confidence in the business. This method prepares the S/4HANA digital core to be audit-ready from day one, thereby eliminating the risk of regulatory, financial, and reputational damage. In summary, architecting out non-compliance enables organizations to be sustainable, compliant, and resilient in their business operations within the increasingly complex and regulated business environment that the global economy has become today. It demonstrates that compliance is a driver of value, not a stumbling block.

Funding: This research received no external funding.
Conflicts of Interest: The authors declare no conflict of interest.
Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

References

[1] Abdel, L., Aziz, R., & Andriansyah, Y. (2023). *The Role Artificial Intelligence in Modern Banking: An Exploration of AI-Driven Approaches for Enhanced Fraud Prevention, Risk Management, and Regulatory Compliance The Role Artificial Intelligence in Modern Banking: An Exploration of AI-Driven Approaches for Enhanced Fraud Prevention, Risk Management, and Regulatory Compliance*. *6*. https://core.ac.uk/download/pdf/578755756.pdf

[2] Cheng, J., Liang, T., Xie, X.-Q., Feng, Z., & Meng, L. (2024). A new era of antibody discovery: an in-depth review of AI-driven approaches. *Drug Discovery Today*, *29*(6), 103984. https://doi.org/10.1016/j.drudis.2024.103984

[3] Cho, H., & Ackom, E. (2025). Artificial Intelligence (AI)-driven approach to climate action and sustainable development. *Nature Communications*, *16*(1). https://doi.org/10.1038/s41467-024-53956-1

[4] Dalal, A. (2025). Maximizing Business Value through Artificial Intelligence and Machine Learning in SAP Platforms. Available at SSRN 5268102. http://dx.doi.org/10.2139/ssrn.5268102

[5] Dawa, H., Neves, J., & Vicente, H. (2025). Evaluating the Impact of Digital Tool Utilization in Dentistry on Burnout Syndrome Among Dentists: An Entropy Analysis and AI-Driven Approach. *Eng*, *6*(3), 47. https://doi.org/10.3390/eng6030047

[6] Devi, Y. (2025). The Future of Cybersecurity: Predicting Trends and Preparing for Emerging Threats. *International Journal of Emerging Research in Engineering and Technology*, 263–275. https://doi.org/10.63282/3050-922X.ICRCEDA25-128

[7] Hussain V B, Rama, V., & Durga, P. (2023). Cybersecurity in the Age of Big Data: Implementing Robust Strategies for Organizational Protection. *International Journal of Engineering and Computer Science*, *12*(09), 25886–25899. https://doi.org/10.18535/ijecs/v12i09.4760

[8] Ibrahim Y, & Khalifa, F. (2025). Role of ERP as an Integrative Intelligent System for Business Enterprises. *Lecture Notes in Networks and Systems*, 368–383. https://doi.org/10.1007/978-3-031-82377-0_31

[9] Karim, M. R., & Saha, R. (2025). *A FRAMEWORK-BASED META-ANALYSIS OF ARTIFICIAL INTELLIGENCE-DRIVEN ERP SOLUTIONS FOR CIRCULAR AND SUSTAINABLE SUPPLY CHAINS*. *01*(01), 432–464. https://doi.org/10.63125/jbws2e49

[10] Kokogho, E., Odio, E., Ogunsola, O., & Nwaozomudoh, M. (n.d.). *Transforming Public Sector Accountability: The Critical Role of Integrated Financial and Inventory Management Systems in Ensuring Transparency and Efficiency*. https://doi.org/10.54660/IJMOR.2024.3.6.84-107

[11] Kyadasu, R. (2025). Exploring Infrastructure as Code Using Terraform in Multi-Cloud Deployments. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.5075647

[12] Lukic V, V., Damnjanovic, A., Cakic, A., Petkovic, D. R., Prelevic, M., Pantovic, V., Stojanovic, M., Vidojevic, D., Vranjes, D., & Bodolo, I. (2024). AI-Driven Approach for Enhancing Sustainability in Urban Public Transportation. *Sustainability*, *16*(17), 7763. https://doi.org/10.3390/su16177763

[13] Naman D, Sengupta, N., M. Madiajagan, K K Patro, P. Lalitha i, Nagwan A S, Ryszard T, Paweł P, & Allam J P. (2024). A pilot study on AI-driven approaches for classification of mental health disorders. *Frontiers in Human Neuroscience*, *18*. https://doi.org/10.3389/fnhum.2024.1376338

[14] Ngwu, C., Liu, Y., & Wu, R. (2025). Reinforcement learning in dynamic job shop scheduling: a comprehensive review of AI-driven approaches in modern manufacturing. *Journal of Intelligent Manufacturing*. https://doi.org/10.1007/s10845-025-02585-6

[15] Sai T N. (2024). Exploring AI and Generative AI in Healthcare Reimbursement Policies: Challenges, Ethical Considerations, and Future Innovations. *International Journal of Medical Toxicology and Legal Medicine*. https://doi.org/10.47059/IJMTLM/V27I5/073