



Internal Auditing in the Context of Enterprise Resource Planning (ERP) Systems: A Case Study of Sider El Hadjar Complex

Khelaifia IMENE ^{1*}, Zaaich MOHAMED ²

¹ University Badji Mokhtar Annaba, Research laboratory in creativity and economic and financial analysis, imene.khelaifia@univ-annaba.dz

² Higher school of management sciences Annaba , Research laboratory in creativity and economic and financial analysis: Algeria, zaaich.mohamed@essg-annaba.dz

Received: 09/11/2025

Accepted: 02/12/2025

Published: 28/12/2025

This study explores the effects of ERP implementation, specifically the SAP system, on the internal audit function at the Sider El-Hadjar Complex, one of Algeria's largest industrial enterprises. The research examines how ERP systems improve audit effectiveness, evidence collection, and risk control while identifying challenges arising from system integration.

The case study approach was employed, combining semi-structured interviews with internal auditors and an analysis of internal audit reports and SAP documentation. The findings indicate that ERP systems substantially enhance audit efficiency, accuracy, and access to real-time data. Auditors are able to perform evidence-based audits more effectively, strengthening governance and internal control mechanisms. However, certain risks remain, including excessive user privileges, inactive accounts, insufficient training, and limited audit trail visibility.

Practical recommendations are provided to improve ERP-enabled auditing in Algerian industrial contexts, focusing on continuous training, robust access management policies, and systematic monitoring procedures.

Keywords: Internal auditing, ERP systems, SAP.

JEL Classification Codes: M40, M49.

1-Introduction:

Over the last two decades, organizations around the world have undergone significant digital transformations that have reshaped their operational and administrative structures. As global competition intensifies and markets become increasingly interconnected, enterprises have adopted integrated information systems to streamline operations, improve decision-making, and support sustainable growth. Among these technological innovations, Enterprise Resource Planning (ERP) systems stand out as comprehensive solutions that manage enterprise-wide processes in a unified platform

ERP systems integrate diverse business functions—including finance, human resources, production, logistics, and sales—into a single system. This integration ensures data consistency, enhances operational efficiency, and promotes cross-departmental transparency. For internal auditors, ERP systems represent both an opportunity and a challenge. They provide access to accurate, real-time data, facilitating evidence-based audits and risk control. However, they also introduce risks related to user management, data entry errors, and potential misuse of system privileges

The Sider El-Hadjar Complex, located in Annaba, Algeria, is one of North Africa's largest steel manufacturers and serves as an important case for studying the impact of ERP systems on internal auditing. The organization implemented the SAP ERP system to integrate its operations, improve coordination among departments, and enhance control mechanisms. This study investigates how this implementation has affected internal auditing in terms of efficiency, quality of evidence, and risk management

Problem Statement

The adoption of ERP systems has transformed internal auditing from a manual, document-based process into a data-driven, system-supported activity. While ERP systems offer significant advantages in terms of accuracy and accessibility, they also demand advanced technical competencies from auditors. Weaknesses in access control or errors in data entry can compromise audit quality and reliability

This study addresses the following central question:

How does ERP implementation affect the internal audit function at the Sider El-Hadjar Complex?

Research Sub-questions

The study is guided by the following research sub-questions, each directly linked to one of the research hypotheses:

1. Does the ERP system enhance the efficiency and effectiveness of internal auditing activities?
2. Does the ERP system improve the quality of audit evidence and support more accurate audit conclusions?
3. Does the effectiveness of ERP-based auditing depend on the competence of users and the strength of governance mechanisms?

Research Hypotheses

- H1: ERP systems enhance the efficiency and effectiveness of internal audit activities compared to traditional methods.
- H2: ERP systems improve the quality of audit evidence and support more accurate audit conclusions.
- H3: The success of ERP-based auditing depends on auditor training and strong system governance mechanisms

Research Objectives

The objectives of this study are to:

- Assess the impact of ERP systems on internal audit efficiency and effectiveness.
- Identify the benefits and risks associated with ERP implementation in auditing.
- Explore auditors' perspectives on ERP as a tool for evidence collection and risk management.
- Provide practical recommendations for strengthening ERP-based audit practices.

Significance of the Study

This study contributes to both academic and practical knowledge. It fills a research gap in the Algerian context, provides insights for organizations implementing ERP systems, and strengthens understanding of how technology-driven auditing can enhance governance, accountability, and transparency.

Study Methodology

This study adopts a qualitative case study design to explore the impact of ERP implementation, specifically the SAP system, on internal auditing at the Sider El-Hadjjar Complex. The case study approach was selected because it allows an in-depth understanding of organizational realities, contextual factors, and behavioral responses related to ERP-enabled auditing.

Literature Review

Addo-Tenkorang and Helo (2011) carried out research focused on ERP lifecycle management and its organizational implications. Their study aimed to explore the advantages and limitations of ERP implementation in enhancing operational integration and internal control. The researchers employed a literature review and case studies methodology, emphasizing both technological and human factors. Results showed that while ERP systems facilitate information sharing and improve decision-making, the success of these systems depends heavily on adequate training, adaptation of staff to new workflows, and effective governance mechanisms.

Ilhem (2015) conducted a study examining the influence of ERP systems on internal audit practices in industrial organizations. The study aimed to understand how ERP platforms, such as SAP, affect audit processes, evidence collection, and risk management. Using a qualitative approach, Ilhem collected data through interviews with auditors and analysis of system-generated reports. The findings revealed that ERP systems significantly enhance auditors' ability to access and analyze data, enabling

more comprehensive audits. However, the study also identified challenges, including incomplete audit trails, dependence on IT specialists, and risks associated with improper access controls.

Khalifa (2020) investigated the relationship between internal auditing and organizational performance in the context of evolving digital practices. The research aimed to determine how the adoption of advanced information systems, including ERP platforms, affects audit efficiency and governance quality. Employing a mixed-methods approach with surveys and interviews, Khalifa concluded that ERP systems significantly improve audit speed, data accuracy, and decision-making support. Nevertheless, the study emphasized that the benefits are contingent upon auditors' technical competence and the establishment of robust control mechanisms.

Distinctive contribution of the current study

Unlike the previous research, this study focuses specifically on the Algerian industrial context, examining the Sider El-Hadjar Complex as a practical case. While most prior studies addressed general ERP adoption or its impact on auditing in broader international contexts, this research provides empirical insights into ERP-enabled auditing within a developing country setting. Moreover, it combines auditors' perspectives with document analysis, offering a detailed view of both operational practices and technical challenges. The study also emphasizes the interaction between system governance, user competence, and audit quality, providing actionable recommendations tailored to Algerian enterprises.

2. The concept of internal audit and enterprise resource planning (ERP):

2.1 concept of internal audit:

Internal auditing has undergone significant evolution over the last ten years, emerging as a pivotal managerial resource dedicated to risk mitigation. It is now integral to the expansive domain of 'corporate governance,' a system encompassing all managerial actions intended to curtail the risks of operational flaws, suboptimal performance, or misconduct. (Management, 2015, p.270)

It is characterized as an impartial and objective assurance and advisory function aimed at delivering value and improving the efficiency of an enterprise's operations. It encompasses the process of recognizing and pinpointing risks that could hinder the achievement of enterprise goals, ensuring that leaders are informed of these risks, and proactively recommending improvements to mitigate them. ((IIA), 2015, p.2)

Building upon these interpretations, internal auditing can be understood as an independent function within the enterprise, tasked with assessing the internal control system, identifying risks, and offering recommendations in the form of a report submitted to the enterprise

The primary aims of internal examination can be outlined as follows :(Abderrahmen, 2016, p.57)

- Assisting in improving management by offering solutions and recommendations;
- Adding value to the institution through practical solutions and recommendations;
- Evaluating risk management systems and processes, and providing solutions for their enhancement;
- Evaluating the effectiveness of internal control frameworks and determining strategies for their enhancement.

The primary responsibilities associated with this function are outlined as follows: (Khalifa, 2020, p.273)

- Independent Evaluation Function: This implies that the auditor operates autonomously from the operations they evaluate.
- Consulting Role: The auditor offers the management team and board of directors pertinent analyses and recommendations, aiding in prompt.
- Confirmation Function: This role encompasses assessing the sufficiency and efficiency of the internal control framework, grounded in the outcomes of risk evaluations.
- Impartial Role: The auditor performs their work impartially, ensuring fairness and objectivity in gathering and evaluating evidence and outcomes

2.2 concept of Enterprise Resource Planning (ERP):

An ERP system transcends a mere software solution; it represents an integrated suite designed to streamline and manage an enterprise's core business processes. Research has shown that an ERP system is more than just software tailored to an enterprise; it acts as an enterprise infrastructure that shapes how employees work, imposing its logic on a company's strategy, operations, and culture (Shehab,p.362).

Enterprise computational ecosystems represent intricate, holistic informational infrastructures that synthesize and orchestrate multidimensional operational processes within corporate entities (Addo-Tenkorang, 2011, p1).

These sophisticated technological architectures interconnect diverse transactional domains, facilitating seamless data transmission and harmonization across disparate functional interfaces.

These primordial technological interventions precipitated the emergence of bespoke, specialized computational solutions focusing on discrete operational domains—initially manifesting as fragmented sales processing and resource allocation mechanisms. Progressively, these disparate functional components converged into unified, synergistic computational ecosystems, incrementally optimizing enterprise operational efficacies through sophisticated integration strategies.

In the late twentieth century, comprehensive digital management frameworks underwent a paradigmatic metamorphosis, transcending technological boundaries and permeating multifarious commercial ecosystems. Revolutionary telecommunication infrastructures and sophisticated algorithmic development methodologies catalyzed transformative computational paradigms. The emergence of hyper-interactive, network-agnostic software architectures precipitated a groundbreaking computational migration towards distributed, virtualized computational environments.

Contemporary integrated strategic management platforms now incorporate emergent cognitive technologies—encompassing algorithmic intelligence, predictive computational learning, semantic linguistic deconstruction, and high-velocity data storage architectures—empowering enterprise entities to optimize operational efficacies, extract nuanced analytical perspectives from heterogeneous informational substrates, and sustain competitive dynamism within an increasingly accelerated global marketplace. (SAP, 2024)

The influence of ERP systems on modern business practices is irrefutable. By centralizing enterprise data and processes, ERP systems enable businesses to align separate departments and improve workflows, leading to significant cost savings. Some specific benefits include: (Corporation, 2024)

- Enhanced business insights from real-time information generated by reports
- Reduced operational costs through streamlined processes and best practices
- Improved collaboration by allowing users to share data in contracts, requisitions, and purchase

orders

- Increased efficiency through a consistent user experience across various business functions and well-defined processes
- Unified infrastructure from the back office to the front office, ensuring all business activities have a consistent look and feel
- Higher user adoption rates due to a standardized user experience and design
- Lower risk through improved data integrity and financial controls
- Reduced management and operational costs through uniform and integrated systems

2.3 The Influence of Enterprise Resource Planning (ERP) on the Internal Auditing Function

Positive effects include: (Ilhem, 2015, p.117)

- Identifying problems, risks, and weaknesses that could not have been discovered manually.
- Easy access to information, eliminating the need for time-consuming, manual searches.
- Enhancing the productivity of internal auditors by saving time and reducing costs, thus adding value to the institution.
- Improving the quality of internal audit outputs.
- Collecting a large volume of evidence and clues.
- Transforming the culture and knowledge of internal auditors, as it requires a solid understanding of integrated management systems and ongoing training to acquire the necessary technical and professional skills

Negative effects include:

Despite the benefits and advantages of ERP, it is not without its problems and risks, which can be summarized as follows: (Ilhem, 2015, p118)

- The disappearance of physical records, as accounting data becomes invisible, and data can be deleted, added, or altered without leaving a trace, making it easier for fraud to occur and harder for internal auditors to detect.
- The lack of a solid audit trail, meaning that data and operations cannot be traced from their origin to their final results, as the data is stored in electronic units that can only be read by specialized software.
- The computer performing multiple tasks that may conflict with the principle of task separation.
- The inability of the computer to think or make personal judgments, leading to the potential for various errors.
- The failure to implement necessary changes at the level of systems and programs

3. Results and discussion:

3.1 Overview of ERP Implementation at Sider El-Hadjar

The Sider El-Hadjar Complex implemented the SAP ERP system in collaboration with the Arcelor Group to enhance operational integration, production management, financial control, and interdepartmental coordination. The SAP system at the complex comprises seven key modules: Material Management (MM), Quality Management (QM), Production Planning (PP), Sales and Distribution (SD), Plant Maintenance (PM), Financial Accounting (FI), and Controlling (CO). Internal auditors engage with these modules during audit missions depending on the focus area, allowing them to examine transactions, inventory, financial data, and production records comprehensively.

3.2 Study sample and data collection methods:

The target population consisted of professionals directly involved in internal auditing, system administration, and ERP-based control at the Sider El-Hadjar Complex. The sample included five internal auditors responsible for operational and financial audits, two IT specialists managing SAP system maintenance and access control, and one senior audit manager supervising audit missions. Participants were selected using purposive sampling, ensuring that the study included individuals with direct experience in ERP-based auditing. This non-probability sampling method was chosen to focus on participants with the most relevant knowledge and expertise.

Data were collected using two main techniques:

- **Semi-structured interviews:** Interviews were conducted in person at the Sider El-Hadjar Complex between May and July 2024, with each session lasting approximately 45–60 minutes. Questions focused on auditors' use of SAP in planning and conducting audits, challenges faced during ERP-based auditing, and perceived improvements in audit quality and efficiency.
- **Document analysis:** Official internal audit reports, SAP access logs, risk registers, and system procedure manuals were reviewed. This provided contextual understanding and allowed for triangulation of the interview data, enhancing the validity of the findings.

3.3 Audit Workflow in the SAP Environment at Sider El-Hadjar

The internal audit department at Sider El-Hadjar follows a three-phase process, which has been reshaped by ERP implementation:

- **Planning Phase:** Auditors develop the audit plan based on risk assessments generated by SAP reports. The scope and objectives are defined and approved by top management, followed by discussions with department heads to align expectations.
- **Execution Phase:** Auditors access SAP to retrieve transaction logs, inventory data, and financial records. Cross-verification between modules ensures consistency, and discrepancies such as duplicate entries or delayed updates are investigated further.
- **Reporting and Follow-up Phase:** Findings are categorized by severity. Draft reports are shared with audit departments for discussion before finalization. Corrective actions are monitored through SAP dashboards, ensuring accountability and transparency.

Auditors reported several advantages associated with SAP use:

- **Enhanced Data Accessibility and Transparency:** Auditors can retrieve real-time data without relying on manual documents, reducing dependence on departmental staff and bias. Immediate access to live data supports faster detection of anomalies.

- **Improved Audit Efficiency:** Centralized information reduces redundant data collection. One auditor noted that SAP saved at least 40% of the time previously spent moving between departments.
- **High-Quality Evidence and Analytical Capacity:** Digital audit trails allow transactions to be traced from origin to completion, strengthening evidence reliability. Detailed logs can be exported to substantiate findings.
- **Long-term Data Retention:** SAP stores large historical datasets, facilitating trend analysis and predictive auditing.
- **Real-time Monitoring and Control:** Automated alerts notify auditors of anomalies such as unauthorized access or inconsistencies between modules, supporting continuous auditing rather than periodic reviews.

Despite the benefits, several challenges were noted:

- **User Account Management:** Inactive or transferred employees' accounts remained active, creating potential security risks.
- **Insufficient Oversight of Access:** Some users had privileges exceeding their job requirements, with no regular review of access rights.
- **Data Input Errors:** Errors at the data entry stage occasionally led to inconsistencies across modules.
- **Limited Audit Trail Visibility:** Not all transactions were configured for traceability, making it difficult to determine responsible users for specific actions.
- **Dependence on IT Specialists:** Auditors frequently relied on IT staff for report extraction and navigation of technical configurations, highlighting gaps in technical skills.

Although primarily qualitative, document analysis and frequency coding of interviews revealed measurable insights.

Table 1. Observations

Dimension	Positive Observations (%)	Negative Observations (%)
Access to Information	100%	0%
Audit Time Efficiency	80%	20%
Quality of Audit Evidence	90%	10%
System Security and Access Control	60%	40%
Training and User Competence	50%	50%

Source: Prepared by the researchers based on the information provided

These findings indicate that ERP systems substantially enhance audit efficiency and evidence reliability, yet human factors such as inadequate training and poor access control remain key limitations.

A detailed audit of the Sales and Distribution module provided practical insights:

- Duplicate accounts allowed employees to access multiple modules simultaneously.
- Several retired employees' accounts remained active for extended periods.
- Unauthorized use of specific transaction codes by employees outside their scope was detected.
- Regular reviews of access control lists were not conducted, increasing fraud risk.
- Input errors in customer orders propagated across modules, affecting financial reconciliation.

Despite these challenges, auditors confirmed that SAP facilitated audit planning, data retrieval, and evidence collection, provided that governance mechanisms were enforced.

The main outcomes of this study can be summarized as follows:

- ERP systems improve audit effectiveness by centralizing and standardizing information.
- SAP enhances audit efficiency, accuracy, and transparency.
- Weaknesses persist in user management, training, and traceability.
- ERP-based auditing requires auditors to possess technical literacy and continuous professional development.
- Strong governance policies are critical to maintain the reliability of ERP-enabled auditing.

3.4 Interpretation of Findings

The findings from the Sider El-Hadjar Complex clearly demonstrate that ERP systems, specifically SAP, have significantly transformed the internal audit process. By providing real-time access to integrated operational and financial data, auditors are able to conduct more thorough and evidence-based audits. The results indicate a substantial improvement in audit efficiency, accuracy, and transparency.

The shift from manual, document-based audits to system-driven, continuous auditing reflects a fundamental change in the internal audit function. Auditors can now monitor transactions in real time, identify anomalies promptly, and reduce redundancy across departments.

The study emphasizes the critical importance of technical competence for auditors in ERP-based environments. Auditors with advanced skills in system navigation and data analytics were able to conduct audits more efficiently and independently, whereas those lacking such skills depended heavily on IT specialists. This dependency can create bottlenecks and compromise audit independence. Continuous professional development and IT literacy are therefore essential for auditors to maintain effectiveness in technology-driven contexts.

The study also underscores the necessity of strong governance mechanisms to ensure the reliability of ERP-enabled auditing. Weaknesses in user access management, lack of regular review of privileges, and incomplete audit trails represent significant risks. Proper configuration of ERP systems, strict access controls, and periodic system audits are crucial to mitigating these risks.

Furthermore, aligning ERP system configuration with audit objectives enhances the auditors' ability to monitor compliance and detect irregularities. Automated alerts, comprehensive logging, and cross-module verification contribute to a proactive auditing approach, reducing reliance on periodic reviews. This demonstrates the interdependence between system governance and audit quality: when governance is weak, audit reliability declines regardless of technological sophistication.

4-Conclusion:

This study examined the impact of ERP systems, specifically the SAP platform, on the internal audit function at the Sider El-Hadjar Complex. The findings demonstrate that ERP implementation significantly enhances audit effectiveness, efficiency, and reliability. By centralizing information, automating processes, and providing access to real-time data, auditors can detect irregularities promptly, make evidence-based decisions, and improve coordination across departments.

The study confirms that ERP systems contribute to higher audit quality by enabling comprehensive evidence collection, reducing redundancy, and promoting transparency. However, the benefits of ERP adoption are contingent upon proper governance, sufficient training, and robust

system management. Weak access controls, incomplete audit trails, and limited technical competence among auditors can compromise the effectiveness of ERP-enabled audits.

Accordingly, all three research hypotheses are supported:

- H1: ERP systems enhance audit efficiency and effectiveness.
- H2: ERP systems improve the quality of audit evidence.
- H3: The success of ERP-based auditing depends on user training and strong governance mechanisms.

Recommendations

Based on the findings, several practical recommendations are proposed to optimize ERP-enabled auditing in industrial organizations:

- **Continuous Training Programs:** Regular training sessions on SAP usage, IT risk management, and audit procedures should be conducted to strengthen auditors' technical competence and confidence.
- **Strengthening Access Control:** Organizations should implement strict procedures for user account management, including regular reviews and immediate deactivation of inactive or duplicate accounts.
- **Enhanced Audit Trail Mechanisms:** ERP systems should be configured to capture comprehensive transaction logs, ensuring full traceability and accountability.
- **Cross-functional Collaboration:** Internal audit, IT, and operational departments should maintain close communication to ensure system governance and early detection of irregularities.
- **Policy and Governance Framework:** Organizations should develop internal ERP governance policies aligned with international standards such as COSO and the IIA frameworks to maintain data integrity and control.
- **Performance Monitoring:** Regular audits of system performance and configuration should be conducted to evaluate ERP effectiveness and identify emerging risks

4. Bibliography List :

1. Abderrahmen, A.-A. (2016). the role of internal auditing in the good practice of corporate governance in light of international standards for the practice of the internal auditing profession.. Journal of Economic and Management Sciences, No. 16.
2. Addo-Tenkorang, R. &. (2011). Enterprise resource planning (ERP): A literature review. International Journal of Business Management, 6(2).
3. Corporation, O. (2024). ERP systems and business transformation. Oracle White Paper.
4. Ilhem, B. (2015). The influence of ERP systems on internal audit practices. Arab Journal of Accounting and Finance, 2(1).
5. Khalifa, H. (2020). Internal auditing and organizational performance: The evolving role in governance. Middle East Journal of Business Research, 8(3).
6. Shehab, E. M. (s.d.). Enterprise resource planning: An integrative literature review. Business Process Management Journal, 10(4).

7. Management, I. a. (2015). Internal audit management. Paris: building on basics, OECD publishing.
8. SAP. (2024). SAP ERP overview and implementation guide. SAP Global Publications.
9. (IIA), I. o. (2015). International Professional Practices Framework (IPPF). International Professional *Practices Framework (IPPF)*. IIA Publications.