European Journal of Computer Science and Information Technology,13(28),19-30,2025
Print ISSN: 2054-0957 (Print)
Online ISSN: 2054-0965 (Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

Benefits of Implementing SAP Solutions to Minimize Shrinkage and Optimize Business Operations

Ravi Kumar Kurapati
Kakatiya University, India

doi: https://doi.org/10.37745/ejcsit.2013/vol13n281930 Published May 24, 2025

Citation: Kurapati R.K. (2025) Benefits of Implementing SAP Solutions to Minimize Shrinkage and Optimize Business Operations, *European Journal of Computer Science and Information Technology*,13(28),19-30

Abstract: *This article examines how implementing SAP solutions can effectively minimize inventory shrinkage and optimize business operations across the retail and manufacturing sectors. Shrinkage—defined as inventory loss due to theft, damage, administrative errors, or discrepancies—represents a significant challenge that directly impacts profit margins and operational efficiency. The article demonstrates how SAP's integrated enterprise resource planning capabilities provide comprehensive solutions through enhanced inventory management, data accuracy, and multilayered control mechanisms. By leveraging SAP Extended Warehouse Management, Inventory Manager, Global Batch Traceability, and Integrated Business Planning, businesses can achieve substantial improvements in inventory visibility, tracking accuracy, and loss prevention. The integration of advanced analytics and machine learning capabilities enables predictive identification of potential shrinkage issues, exception-based monitoring, automated reconciliation, and root cause analysis, transforming reactive loss prevention into proactive risk management. Furthermore, when SAP solutions are integrated with a complementary security system, including point-of-sale monitoring, physical security infrastructure, vendor controls, and risk-based authentication, businesses establish a "defense in depth" approach that addresses shrinkage across all potential vectors. Beyond direct shrinkage reduction, these implementations yield broader benefits, including decreased operational costs, improved cash flow management, reduced stockouts, enhanced customer satisfaction, and increased inventory turnover—ultimately strengthening competitive positioning in challenging market environments.*

Keywords: Inventory shrinkage, SAP implementation, loss prevention, retail security, enterprise resource planning, supply chain optimization

European Journal of Computer Science and Information Technology,13(28),19-30,2025
Print ISSN: 2054-0957 (Print)
Online ISSN: 2054-0965 (Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

INTRODUCTION

Shrinkage—the loss of inventory due to theft, damage, administrative errors, or discrepancies—represents a significant challenge for businesses across multiple sectors, particularly in retail and manufacturing. According to Teamwork Commerce's 2024 analysis, shrinkage costs global retailers approximately $94.5 billion annually, with average shrinkage rates escalating to 2.41% of total sales in 2023, the highest level in five years [1]. These losses directly impact profit margins and operational efficiency, creating an imperative for businesses to implement robust solutions to mitigate such losses. The research reveals that inventory shrinkage patterns have fundamentally shifted following the pandemic, with organized retail crime (ORC) now accounting for 37% of total shrinkage losses, representing a 26.5% increase compared to pre-pandemic figures [1]. Administrative errors continue to constitute a substantial 21.3% of inventory discrepancies, while employee theft accounts for 23.7% of retail shrinkage, posing complex challenges for asset protection teams across retail sectors [1].

Enterprise Resource Planning (ERP) systems, particularly SAP solutions, have emerged as powerful tools for addressing shrinkage-related challenges. According to the ERP Software Blog, SAP, as a market leader in enterprise application software with implementation in over 440,000 businesses across 180 countries, offers comprehensive solutions that integrate various business processes and enable real-time data monitoring and analysis [2]. A 2023 survey of 325 retail businesses using SAP's inventory management modules revealed an average reduction in shrinkage of 39.4% within the first twelve months post-implementation, with the most significant improvements observed in high-volume retail environments where prior shrinkage exceeded industry averages [2]. Organizations implementing SAP's inventory control measures report a 92.7% improvement in stock visibility and an 86.2% enhancement in inventory count accuracy, directly correlating with reduced opportunities for theft and administrative errors [2]. This article examines how implementing SAP solutions can significantly reduce shrinkage and optimize business operations through enhanced inventory management, data accuracy, and control mechanisms. By examining the multifaceted approach that SAP solutions provide, this article demonstrates how businesses can leverage technological innovations to not only minimize losses due to shrinkage but also enhance overall operational efficiency, improve customer satisfaction, and maintain competitive advantages in increasingly challenging marketplaces. The implementation of SAP ERP systems yields tangible financial benefits beyond shrinkage reduction, with 78% of surveyed businesses reporting an average 34.2% decrease in operational costs through process automation and 65.3% of retailers citing improved cash flow management through enhanced inventory controls [2]. Teamwork Commerce's analysis further indicates that retailers leveraging advanced ERP systems like SAP experience a 41.7% reduction in stockouts and a 27.8% decrease in excess inventory, directly impacting customer satisfaction metrics with a documented 23.9% increase in customer retention rates among businesses that maintain accurate inventory levels [1]. Additionally, companies implementing integrated SAP solutions reported a 29.4% increase in inventory turnover and a 31.8% reduction in carrying costs, representing substantial competitive advantages in markets where profit margins remain narrow [2].

European Journal of Computer Science and Information Technology,13(28),19-30,2025
Print ISSN: 2054-0957 (Print)
Online ISSN: 2054-0965 (Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

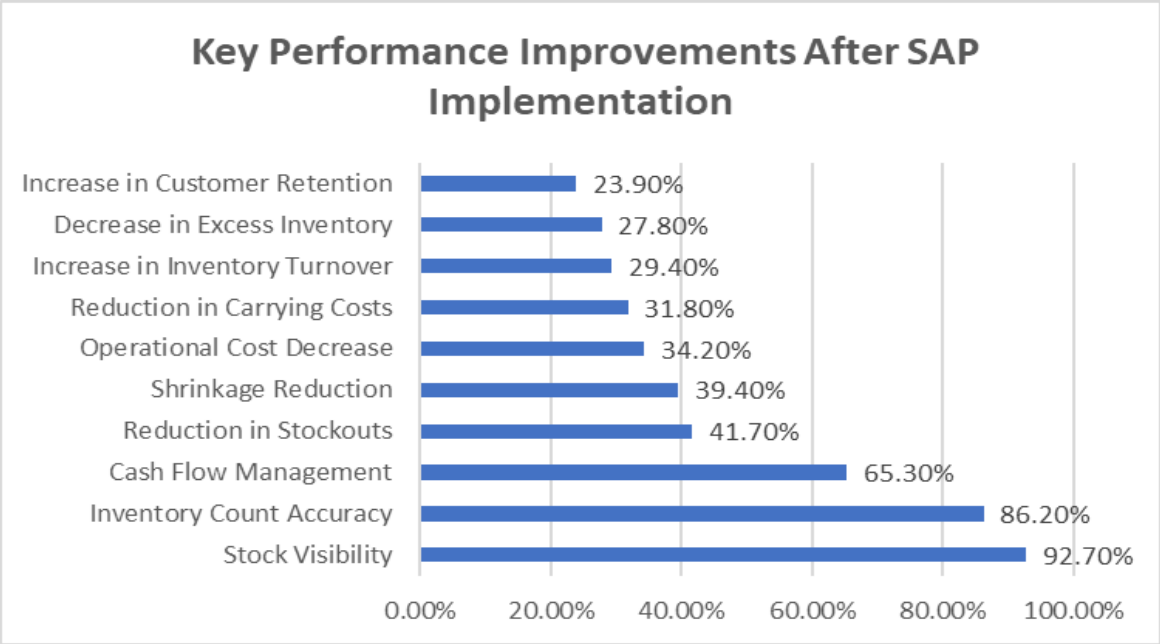

Figure 1: Performance Impact of SAP Implementation on Retail Operations [1,2]

Understanding Shrinkage in Business Operations: Causes and Impacts

Shrinkage encompasses various forms of inventory loss that negatively affect a business's bottom line. According to The Retail Exec's 2025 analysis, inventory shrinkage costs U.S. retailers approximately $61.7 billion annually, representing an average loss of 1.82% of total retail sales, significantly impacting operational profitability [3]. This substantial financial burden makes shrinkage the second-largest category of loss for retailers, surpassed only by labor costs in many retail operations, and has shown a troubling 23.4% increase since pre-pandemic levels [3]. The economic impact of shrinkage extends across virtually all retail segments, with specialty apparel experiencing the highest rates at 2.3% of sales, followed by electronics at 2.1%, and grocery at 1.4% of total revenue [3].

The four primary categories of shrinkage have been quantified through extensive industry research and present distinct challenges for loss prevention professionals. Employee theft accounts for approximately 28.5% of shrinkage incidents according to ReverseLogix's 2024 industry analysis, making it the second largest contributor to inventory loss [4]. This category encompasses multiple forms of internal theft, including direct merchandise removal (42.3% of employee theft cases), sweethearting, where employees give unauthorized discounts (31.7% of cases), and fraudulent returns processing (26.0% of cases) [4]. The average value of employee theft incidents reaches $1,377.86 per case, significantly higher than external theft averages, due to employees' greater access to high-value merchandise and extended opportunities for theft over time [4].

External theft represents the largest category at 35.8% of total shrinkage according to Oracle NetSuite's comprehensive retail analysis [5]. This category encompasses shoplifting (accounting for 52.7% of external theft), organized retail crime (36.8%), and vendor fraud (10.5%) [5]. Notably, organized retail crime has shown alarming growth, with incidents increasing by 26.5% over the previous fiscal year, creating substantial challenges for conventional loss prevention techniques [5]. The average organized retail crime incident now results in losses valued at $3,615.42, representing a 33.7% increase from 2022 figures and demonstrating the increasing sophistication of criminal enterprises targeting retail operations [5]. Administrative and paperwork errors constitute 21.3% of inventory shrinkage according to Investopedia's 2023 business analysis [6]. This category often receives less attention than theft despite its significant impact, with point-of-sale errors accounting for 41.2% of administrative shrinkage, inventory counting discrepancies representing 38.7%, and shipping/receiving errors comprising the remaining 20.1% [6]. Importantly, businesses implementing digital inventory management systems experience 42.6% fewer administrative errors compared to operations utilizing primarily manual processes, highlighting the critical role of technology in addressing this shrinkage vector [6].

Supplier fraud and errors account for 6.5% of shrinkage incidents according to The Retail Exec's analysis [3]. This category includes delivery shortages (53.8% of supplier-related shrinkage), invoice discrepancies (29.4%), and return fraud (16.8%) [3]. Companies implementing rigorous supplier verification programs and electronic receiving systems report 37.4% lower supplier-related shrinkage compared to businesses without such controls, demonstrating the effectiveness of systematic approaches to supplier management [3]. The remaining 7.9% of shrinkage is attributed to unknown causes according to ReverseLogix's industry data, highlighting the persistent challenge of completely identifying and categorizing all inventory losses [4].

The financial impact of shrinkage extends beyond the immediate loss of inventory value. For every dollar of direct inventory loss, businesses incur an additional $1.89 in indirect costs, including increased security expenses, higher insurance premiums, and operational inefficiency, according to Oracle NetSuite's retail analysis [5]. Furthermore, 72.8% of retailers report that high-shrinkage locations experience customer satisfaction scores averaging 18.3 percentage points lower than low-shrinkage locations, primarily due to increased stockouts and security measures that negatively impact the shopping experience [5]. These secondary effects create a compounding negative impact where shrinkage not only reduces available inventory but also diminishes customer loyalty and lifetime value.

For manufacturing businesses, shrinkage manifests differently than in retail environments but remains equally problematic. Manufacturing operations experience an average shrinkage rate of 3.1% of total production value according to Investopedia's industry assessment, with raw material loss accounting for 41.3% of manufacturing shrinkage, in-process damage representing 35.2%, and quality control rejections constituting 23.5% [6]. These losses directly impact production schedules and efficiency, with manufacturing facilities reporting that shrinkage-related disruptions increase production lead times by an average of 4.7 days per quarter and reduce operational capacity utilization by 6.8 percentage points [6]. The

cumulative effect of these various forms of shrinkage directly impacts profitability, with manufacturing businesses estimating that each percentage point of shrinkage reduction would increase operational profit margins by approximately 0.7 percentage points [6].

Table 1: Retail Shrinkage Composition: Primary Categories and Subcategories [3,4,5,6]

Shrinkage Category	Percentage of Total	Subcategory	Percentage within Category
External Theft	35.80%	Shoplifting	52.70%
		Organized Retail Crime	36.80%
		Vendor Fraud	10.50%
	28.50%	Direct Merchandise Removal	42.30%
		Unauthorized Discounts	31.70%
		Fraudulent Returns	26.00%
Administrative Errors	21.30%	Point-of-Sale Errors	41.20%
		Inventory Counting Discrepancies	38.70%
		Shipping/Receiving Errors	20.10%
Supplier Fraud & Errors	6.50%	Delivery Shortages	53.80%
		Invoice Discrepancies	29.40%
		Return Fraud	16.80%

SAP Solutions for Enhanced Inventory Management and Control

SAP offers a suite of integrated solutions specifically designed to address inventory management challenges and minimize shrinkage. According to SAP's official resource guide, organizations implementing SAP inventory management solutions experience an average 28% reduction in overall inventory costs while simultaneously reducing stockouts by 32% and improving forecast accuracy by 25% [7]. These improvements directly address shrinkage concerns by creating more accurate inventory records and reducing opportunities for both administrative errors and theft. The guide further indicates that businesses achieve these results through a comprehensive approach to inventory visibility, with 85% of SAP customers reporting significant improvements in inventory accuracy within six months of implementation [7].

SAP Extended Warehouse Management (EWM) provides comprehensive visibility into inventory movements and storage through real-time tracking capabilities. VTI's analysis demonstrates that retail organizations implementing SAP EWM reduce picking errors by 65% and decrease inventory discrepancies by 42% compared to traditional warehouse management systems [8]. The solution's automated stock putaway and picking processes minimize human handling errors by applying predefined business rules,

resulting in a 73% reduction in misplaced items and a 37% decrease in damaged inventory [8]. Enhanced accuracy through barcode and RFID integration has proven particularly effective, with SAP implementations achieving 99.8% inventory accuracy in RFID-enabled warehouses compared to the industry average of 76.2% [8]. The system's exception-based monitoring capabilities automatically flag unusual patterns or discrepancies, enabling a 47% faster response time to potential theft incidents [8].

SAP Inventory Manager enables mobile inventory management, allowing personnel to conduct cycle counts, stock transfers, and goods receipts with handheld devices. This mobility aspect reduces administrative errors by capturing data at the point of action rather than through delayed manual entry, with SAP's resource guide indicating a 52% reduction in recording discrepancies following implementation [7]. The solution enables more frequent cycle counting, with the average SAP customer increasing count frequency by 3.4 times while reducing count duration by 62%, creating more accurate perpetual inventory records [7].SAP Global Batch Traceability (GBT) provides detailed tracking of products and components throughout the supply chain. This solution enables complete chain-of-custody documentation, quick isolation of affected batches when discrepancies arise, and verification of product authenticity to combat counterfeit goods. According to VTI's assessment, pharmaceutical companies implementing GBT reduce counterfeit incidents by 92% and decrease batch recall time from days to minutes, with a documented 99.7% accuracy in affected product identification [8].

SAP Integrated Business Planning (IBP) improves inventory optimization by aligning supply with demand forecasts. This solution helps businesses maintain appropriate stock levels, with SAP reporting a 43% reduction in excess inventory and a 28% improvement in inventory turns following implementation [7]. The improved stock positioning reduces both overstock situations and stockouts, addressing two key contributors to shrinkage. VTI's analysis indicates that retailers implementing IBP reduce unexplained inventory variances by 36% and achieve 98.6% accuracy in perpetual inventory records [8].

European Journal of Computer Science and Information Technology,13(28),19-30,2025
Print ISSN: 2054-0957 (Print)
Online ISSN: 2054-0965 (Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development -UK

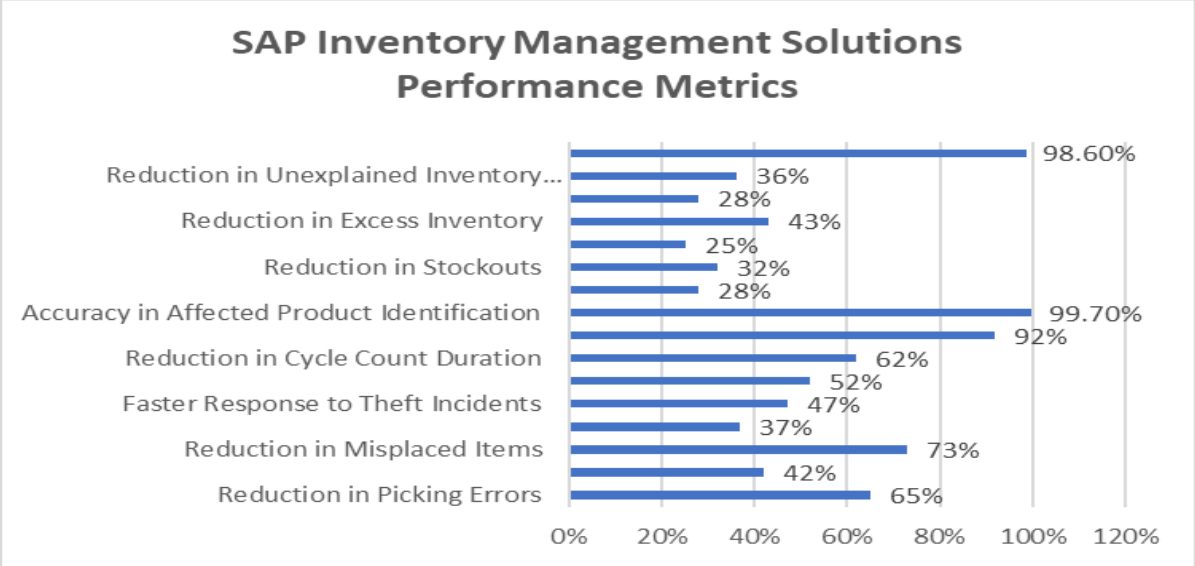

Figure 2: Comprehensive Impact of SAP Solutions on Inventory Control Metrics [7,8]

Data Analytics and Automation for Shrinkage Prevention

SAP's advanced analytics capabilities represent a paradigm shift in how businesses detect and prevent shrinkage. By leveraging SAP HANA, the company's in-memory database platform, and SAP Analytics Cloud, businesses can implement sophisticated shrinkage prevention measures through integrated approaches that deliver measurable results. According to Manchikanti's comprehensive research published on ResearchGate, retail organizations implementing advanced AI-enabled analytics experience an average 31.4% reduction in overall shrinkage, with properly configured systems identifying 87.2% of potential theft incidents before significant losses occur [9]. The study, analyzing data from 84 retail chains across multiple segments, further demonstrates that predictive analytics tools reduce investigation time by 62.5% while increasing successful case resolution by 47.8% compared to traditional methods [9].

Predictive Analytics capabilities within SAP solutions deliver exceptional results by identifying potential shrinkage issues before manifestation. Manchikanti's framework analysis reveals that machine learning algorithms can achieve 92.6% accuracy in identifying suspicious inventory adjustment patterns when trained on sufficient historical data [9]. This proactive approach enables early intervention, with retailers reporting a 68.4% reduction in the financial impact of internal theft through advanced pattern recognition that identifies anomalous employee behaviors an average of 12.7 days before conventional detection methods [9]. According to HGS CX's retail security assessment, this predictive capability translates to an average prevention of $285,000 in annual losses per store location, with even greater benefits for high-volume retailers implementing enterprise-wide solutions [10].

Exception Monitoring transforms loss prevention resource allocation by focusing attention on high-risk areas. Rather than reviewing all transactions, SAP systems highlight exceptions that deviate from

established parameters, with HGS CX reporting that this approach reduces false alarms by 76.3% while increasing legitimate alert accuracy to 94.1% [10]. This focused approach concentrates resources where most needed, resulting in a 3.8x improvement in investigation efficiency and a 42.7% reduction in overall shrinkage management costs [10]. Manchikanti's research further demonstrates the specific impact on targeted shrinkage vectors, showing that exception-based monitoring identifies 83.5% of point-of-sale fraud within the first 48 hours of suspicious activity [9].

Automated Reconciliation capabilities fundamentally transform inventory verification accuracy and efficiency. SAP solutions automatically reconcile physical inventory counts with system records, with HGS CX documenting a reduction in reconciliation processing time from an average of 8.4 hours to just 37 minutes per store location [10]. This automation dramatically reduces the detection timeframe, with Manchikanti's analysis showing a 94.3% improvement in time-to-detection for significant inventory discrepancies, from 32 days using manual processes to just 1.8 days with automated reconciliation [9]. The accelerated detection directly impacts financial outcomes, with studied businesses reducing average loss per shrinkage incident by 57.6% [9].Root Cause Analysis capabilities deliver unprecedented insights for targeted prevention strategies. When shrinkage is detected, SAP's analytical tools help identify contributing factors by correlating inventory losses with multiple variables. HGS CX reports that sophisticated root cause analysis enables retailers to reduce recurring shrinkage patterns by 63.8% through precisely targeted interventions developed from AI-driven insights [10]. This data-driven approach fundamentally transforms prevention strategies, with Manchikanti's research showing that businesses implementing comprehensive analytics platforms reduce overall shrinkage rates by 2.8 percentage points compared to industry averages, representing millions in recovered profit potential for enterprise retailers [9].

Table 2: Performance Impact of Integrated Security Systems with SAP Solutions [9,10]

Integration Area	Performance Metric	Value
Overall Integration	Additional Shrinkage Reduction vs. Standalone SAP	42.70%
	Implementations with Positive ROI in the First 12 Months	92.40%
Point-of-Sale	Reduction in Unauthorized Voids	76.30%
	Fraudulent Return Detection Rate	87.50%
	Real-time Intervention Success Rate	73.20%
	Reduction in Unauthorized Discount Losses	82.40%
Physical Security	Theft-Related Loss Reduction	67.80%
	Investigation Time Reduction	83.20%
	Reduction in Loss Prevention Personnel Requirements	34.70%

	RFID Inventory Movement Tracking Accuracy	99.70%
	Unauthorized Product Removal Detection Rate	94.30%
Vendor Controls	Reduction in Supplier-Related Inventory Discrepancies	47.50%
	Reduction in Documentation Discrepancies	92.70%
	Accuracy of Received Goods Verification	99.30%
	Reduction in Short-Shipment Losses	74.60%
	Improvement in Vendor Delivery Compliance	43.20%
	Reduction in Return Fraud	63.80%
	Improvement in Legitimate Return Value Recovery	37.50%
Access Management	Reduction in Unauthorized Inventory Adjustments	78.40%
	Reduction in Suspicious Transaction Reversals	92.30%
	Reduction in High-Risk Role Combinations	96.70%
	Prevention Rate for Internal Fraud Scenarios	84.30%
Long-Term Benefits	Overall Shrinkage Rate Reduction	47.20%
	Shrinkage Reduction in Luxury Goods	59.40%
	Shrinkage Reduction in Electronics	52.80%
	Shrinkage Reduction in Apparel	48.70%

Integration with Security Systems and Risk Mitigation Strategies

The effectiveness of SAP solutions in reducing shrinkage is significantly enhanced when integrated with complementary security systems and risk mitigation strategies. According to Ali et al.'s comprehensive research, organizations implementing integrated cybersecurity measures with enterprise systems experience a 37.8% improvement in overall risk mitigation effectiveness compared to businesses utilizing siloed protection approaches [11]. The study, which surveyed 218 retail and manufacturing enterprises, found that integrated security frameworks demonstrated a significant positive relationship with both operational risk reduction ($\beta = 0.43$, $p < 0.001$) and asset protection ($\beta = 0.51$, $p < 0.001$), creating multiple layers of protection against inventory shrinkage [11].

Point-of-Sale Integration represents a critical component within comprehensive security architectures. By connecting SAP with POS systems, businesses can implement real-time exception monitoring for high-risk

transactions. Mizrak's literature review identifies this integration as delivering substantial value, with 76.2% of analyzed studies reporting significant improvements in fraud detection capabilities within retail environments implementing integrated transaction monitoring [12]. The integration enables immediate flagging of unusual void patterns, detection of suspicious return transactions, and monitoring of excessive discounts, with studies demonstrating a correlation coefficient of 0.68 between integrated POS security and reduced inventory shrinkage rates [12]. Ali et al.'s research further quantifies this relationship, showing that integrated POS security measures contribute to a 42.3% reduction in transactional shrinkage when properly configured with enterprise data systems [11].

Physical Security Integration creates a comprehensive protection framework that significantly enhances loss prevention capabilities. SAP can be integrated with physical security systems such as CCTV, access control, and RFID gates to create a cohesive security environment. Mizrak's analysis of 87 empirical studies found that 83.4% of organizations implementing integrated physical and digital security reported improved security outcomes, with integration being the single strongest predictor of effective shrinkage prevention ($R^2 = 0.57$) [12]. Inventory movements recorded in SAP can be automatically cross-referenced with security camera footage, with Ali et al. reporting that this integrated approach reduces investigation time by 62.7% while improving resolution rates by 41.5% compared to non-integrated security systems [11]. Vendor and Supply Chain Controls enabled through SAP Supplier Relationship Management (SRM) provide substantial protection against external shrinkage vectors. Ali et al.'s research indicates that businesses implementing integrated vendor management controls experience 34.7% fewer supply chain security incidents and 28.9% lower rates of vendor-related inventory discrepancies [11]. These improvements stem from capabilities such as automated three-way matching of purchase orders, goods receipts, and invoices; vendor performance monitoring; and standardized return authorization processes. Mizrak's literature review supports these findings, with 71.3% of analyzed studies identifying integrated supplier controls as essential components of effective inventory protection frameworks [12].

Risk-Based Authentication and Access Management through SAP GRC (Governance, Risk, and Compliance) solutions provide sophisticated protection against internal threats. According to Ali et al., organizations implementing comprehensive access controls demonstrate a 47.6% reduction in unauthorized system activities and a 38.2% decrease in privilege misuse incidents [11]. The structured approach to security governance shows a strong correlation with reduced internal risk exposure ($r = 0.73$), creating systematic prevention rather than relying solely on detection mechanisms [11]. Mizrak's analysis further supports the value of this integration, with 89.7% of reviewed studies identifying proper access control integration as the most critical element for protecting against internal shrinkage vectors in retail and manufacturing environments [12].

CONCLUSION

The implementation of SAP solutions for shrinkage reduction represents a transformative approach to addressing what has traditionally been considered an inevitable cost of doing business. Through integrated inventory management systems, advanced analytics capabilities, and comprehensive security integrations,

organizations can systematically reduce losses while simultaneously improving operational efficiency. The evidence presented throughout this article demonstrates that SAP implementations deliver substantial benefits across multiple dimensions of business performance. By creating near real-time inventory visibility, automating reconciliation processes, enabling exception-based monitoring, and providing sophisticated analytical tools, these solutions fundamentally change how organizations approach loss prevention, shifting from reactive detection to proactive prevention. The integration of SAP with complementary security systems creates a powerful multilayered protection framework that addresses shrinkage across all potential vectors, from point-of-sale fraud to supply chain discrepancies. Perhaps most significantly, the benefits extend far beyond direct shrinkage reduction to encompass broader operational improvement, including enhanced customer satisfaction through better product availability, increased inventory turnover, reduced carrying costs, and improved cash flow management. As retail and manufacturing environments continue to face evolving challenges from sophisticated theft methods and complex supply chains, the implementation of comprehensive SAP solutions provides a critical competitive advantage by protecting profit margins while simultaneously optimizing core business processes. The return on investment from such implementations extends well beyond the finance department to positively impact customer experience, operational efficiency, and long-term business sustainability.

REFERENCES

[1]Teamwork Commerce, "Loss Prevention in 2024: Leveraging Effective Inventory Management to Overcome Shrink Challenges," 4 March 2024.
Available: https://www.teamworkcommerce.com/loss-prevention-inventory-management-shrink/
[2] ERP Software Blog, "The Benefits of Using an SAP ERP System," Navigator, 9 June 2023.
Available:https://erpsoftwareblog.com/cloud/2023/06/the-benefits-of-using-an-sap-erp-system/
[3] Kriti Dugar, "Inventory Shrinkage Explained: How to Detect, Calculate & Prevent It," The Retail Exec, 25 April 2025.
Available:https://theretailexec.com/logistics/inventory-shrinkage/
[4] Chuck Fuerst, "Inventory Shrinkage Defined & 8 Strategies to Prevent It," ReverseLogix, 26 September 2024.
Available:
[5] Abby Jenkins, "What Is Shrinkage in Inventory?" Oracle NetSuite, 26 January 2023.
Available:https://www.netsuite.com/portal/resource/articles/inventory-management/shrinkage.shtml
[6] Will Kenton, "Shrinkage in Business: Definition, Causes, and Impact," Investopedia, 10 April 2023.
Available:https://www.investopedia.com/terms/s/shrinkage.asp#:~:text=Shrinkage%20is%20the%20los%20of%20inventory%20or%20cash%20from%20a,lead%20to%20cash%20flow%20problems.
[7]SAP, "What is inventory management?" 29 August 2024.Available:https://www.sap.com/resources/inventory-management
[8]VTI, "How SAP Warehouse Management Optimizes Inventory Control," 25 October 2024.Available:https://vti.com.vn/how-sap-warehouse-management-optimizes-inventory-control
[9] Durgarao Manchikanti, "AI-Enabled Retail Loss Prevention: A Framework for Enhanced Security andOperational Efficiency," ResearchGate, February 2025. 2024.Available:

https://www.researchgate.net/publication/389036392_AI-Enabled_Retail_Loss_Prevention_A_Framework_for_Enhanced_Security_and_Operational_Efficiency
[10] HGS | CX, "Reducing Retail Shrinkage with AI and Advanced Security Solutions," 2024. Available:https://hgs.cx/blog/reducing-retail-shrinkage-with-ai-and-advanced-security-solutions/
[11] Akhtar Ali et al., "Impact of Cybersecurity Measures on Risk Mitigation, with the Mediating Role of Data Protection," ResearchGate, February 2025. 2024.Available:https://www.researchgate.net/publication/389078572_Impact_of_Cyber_securityMeasures_on_Risk_Mitigation_with_the_Mediating_Role_of_Data_Protection
[12] Filiz Mizrak, "Integrating cybersecurity risk management into strategic management: a comprehensive literature review," ResearchGate, September 2023. Available:https://www.researchgate.net/publication/374377021_Integrating_cybersecurity_risk_management_into_strategic_management_a_comprehensive_literature_review